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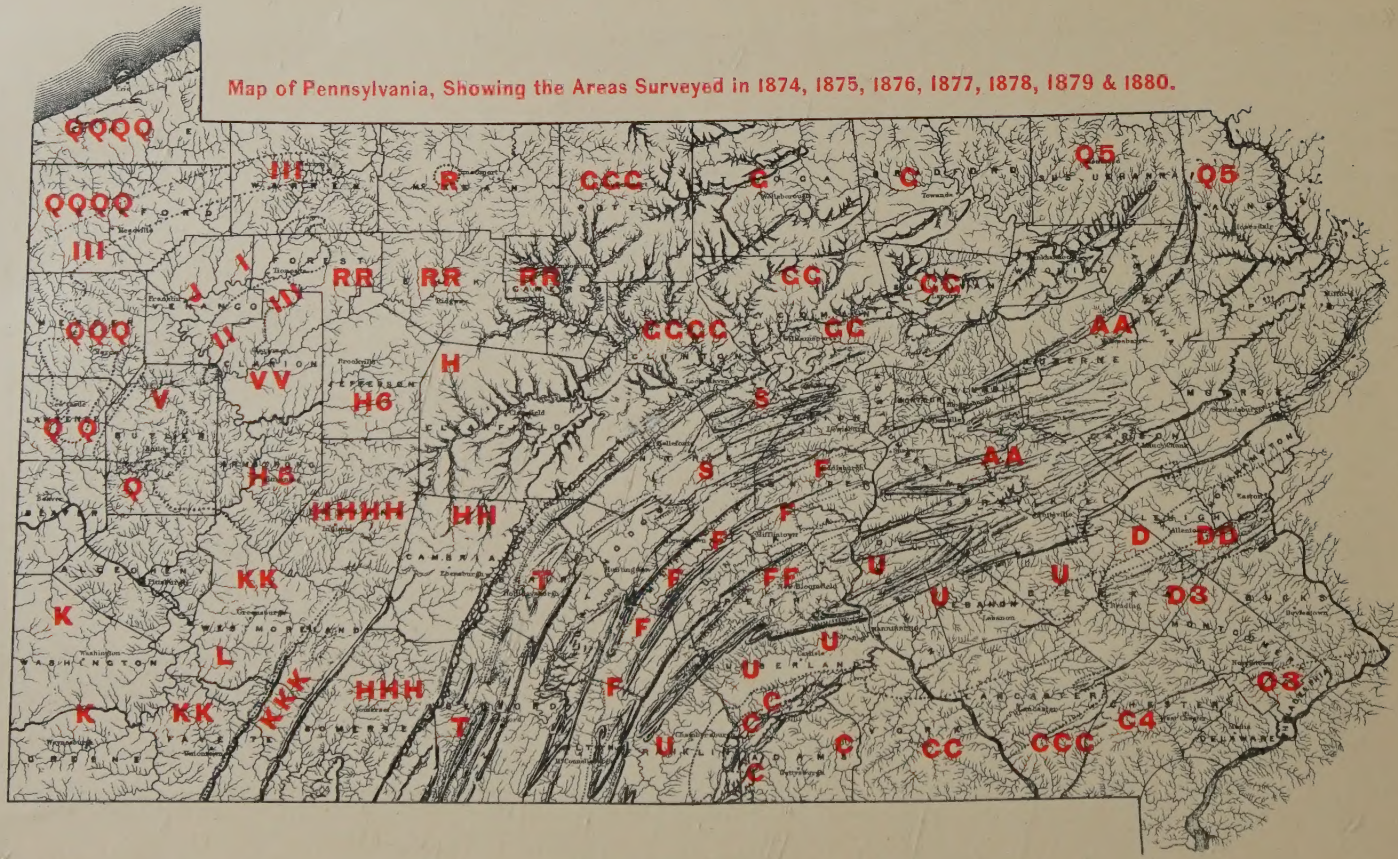
Map of Pennsylvania, Showing the Areas Surveyed in 1874, 1875, 1876, 1877, 1878, 1879 & 1880.
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SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA:
1879-1880.
M³.

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THIRD

REPORT OF PROGRESS

IN THE

# LABORATORY OF THE SURVEY

AT

HARRISBURG,

BY

ANDREW S. McCREATH.

WITH 2 INDEXES AND MAP.

HARRISBURG:
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LABORATORY OF THE GEOLOGICAL SURVEY,
223 MARKET STREET,
HARRISBURG, *April 15, 1881.*

Prof. J. P. LESLEY,
*State Geologist:*

DEAR SIR: I herewith present my third report of the work of the Laboratory of the Survey, being a record of all the analyses made since the publication of Volume MM.

A considerable portion of my time last summer was spent in visiting the principal iron ore mines of the Cumberland Valley, and selecting average specimens of the ores for analysis. In the prosecution of this work I have to acknowledge the valuable assistance received from Col. Geo. B. Wiestling, Supt. Mont Alto Iron Works; T. B. Kennedy, Esq., President of the Cumberland Valley railroad; Henry McCormick, Esq., Harrisburg; and Mr. Daniel King, Supt. Pine Grove Iron Works. To these gentlemen especially, and to several others who furnished me with information in regard to the location of the different ore banks, I desire to tender my hearty thanks.

I would also mention, in terms of the highest praise, the valuable assistance and coöperation which I have at all times received from Mr. John M. Stinson, my assistant in the Laboratory.

It is proper that I should here correct a mistake which occurred in my Report MM, and which I only saw after the volume had been issued. My name should not appear on Plate I, page 404, in connection with an apparatus for carbon determinations. This apparatus was designed by Mr. Andrew A. Blair; and I make this correction in justice to myself as well as to Mr. Blair, who alone is entitled to the credit of the Plate, as explained in my foot note, page 404, MM.

Yours respectfully,
ANDREW S. McCREATH.

# TABLE OF CONTENTS.


| | | Page. |
|---|---|---|
| Preface, | | ix |
| Chapter I. | Iron ores, | 1 |
| Chapter II. | Coals and cokes, | 55 |
| | Phosphorus in coals and cokes, | 78 |
| Chapter III. | Limestones, | 79 |
| Chapter IV. | Fire-clays, | 95 |
| Chapter V. | Miscellaneous, | 99 |

# PREFACE.

Everywhere throughout Pennsylvania wherever the great limestone formation No. II occurs, there are found more or less important deposits of brown hematite iron ore. It is this horizon which has supplied the greater part of the stock to the furnaces along the Lehigh, Schuylkill and Susquehanna rivers, and the whole of the stock to the old furnaces of the Kishicoquilis, Nittany, and Canoe valleys, and Morrison's Cove, in Middle Pennsylvania, as well as to the furnaces in Mountain Creek valley in Cumberland county, and Path valley and the Conecocheague region of Franklin county.

They are scattered over the surface of the southern or limestone half of the Cumberland valley, from the Lehigh river to Maryland, and southward through Virginia and East Tennessee to Alabama. (MM, p. 199.) But they are distinguishable into ores at the top, ores in the middle, and ores at the bottom of the great limestone formation No. II. Those at the top form a belt along the middle of the valley where the Magnesian limestone underlies the Trenton limestone, or in its absence the Utica or Hudson river slates, formation No. III. This line of ore deposits is represented by the great mines of Ironton in Lehigh and Moselm in Berks counties; the mines along Spruce creek in Centre and Blair; the Henrietta, Leathercracker and Bloomfield mines in Morrison's Cove, Blair county; and the old Mt. Pleasant and Carrick furnace banks in Path valley, Franklin county.

Those in the middle are connected with various horizons of ferruginous limestones in the chazy and calciferous. Those at the bottom, along the north or west foot of the South Mountain–Blue Ridge range, are geologically connected with the Pottsdam sandstone, or the slates which

intervene between it and the base of the calciferous, and are *locally* known as "Mountain ores." This lower line of ore deposits is represented by the great mines of Springfield in Canoe valley, Blair county; at Pine Grove, Boiling Springs and at the No. 1 Clever mammoth bank in Cumberland county; at Pond bank and Mont Alto in Franklin county; and a long line through the Shenandoah valley in Virginia.

In the Cumberland valley in York, Cumberland and Franklin counties these ores have been very extensively mined both for local use in the furnaces of the valley and for shipment to Harrisburg, Reading, Columbia, &c., to be smelted along with the more refractory magnetites. The best developments have been made along the line of the South Mountain railroad; at Boiling Springs; at Cleversburg; and near Shippensburg in Cumberland county; along the line of the Mont Alto railroad: and in Path valley in Franklin county; and on Dogwood run in York county.

Near Dillsburg in York county there is an important group of magnetic iron ore mines, connected with the Mesozoic sandstone, which have of late received considerable attention from owners of blast furnaces. These ores, carrying only a small percentage of phosphorus, have been largely used in the manufacture of Bessemer pig iron. Some of them carry a considerable percentage of sulphur as iron pyrites, and all of them contain large quantities of lime and magnesia in the form of *silicates*. In this and in many other respects they resemble the celebrated Cornwall ore of Lebanon county.

In addition to the ores mentioned above, there are found near Mercersburg and at other localities in Franklin county important deposits of *bog ore*, which are now being quite extensively developed. From 1876 to 1880 nearly ten thousand tons of this ore were mined, nearly four thousand tons of it during 1880. The ore is generally found in the slates of formation No. III, and has evidently resulted from the decomposition of iron pyrites, the large percentage of sulphuric acid which they invariably carry going to confirm this view. They are characterized by an almost uni-

formly *low percentage of phosphorus* and by being practically free from manganese.

In Warren township, Franklin county, formation No. VIII is exposed. This sometimes carries iron ore deposits of considerable importance. The Marcellus ore bed of this formation immediately underlies the black slates and overlies the green calcareous shales. But the ore is extremely variable in thickness. Sometimes the bed is so thin that it is not worth working, while, on the other hand, it is often 10 or 12 feet thick. The ore is a brown hematite only at the outcrop; deep mining always shows an earthy carbonate of iron, or a dark pyritous clay. In Huntingdon, Juniata and Perry counties considerable quantities of ore have been mined from this horizon. The ore is generally of good quality, being comparatively rich in iron and low in phosphorus.

The following table has been prepared to show, in a condensed form, the general average character of the Cumberland Valley ores, and, also, the proportion of phosphorus which each will yield in 100 parts iron. The analyses are arranged in order, according to the amount of phosphorus in 100 parts iron.

TABLE I.

| No. of ore bank. | NAME OF ORE BANK. | Per cent. iron. | Per cent. manganese. | Per cent. phosphorus. | Phosphorus in 100 parts iron. |
|---|---|---|---|---|---|
| 93*a* | Landis or Fuller—Upper level, | 48.350 | .122 | .018 | .037 |
| 88 | Longnecker—Old opening, | 38.350 | .079 | .016 | .041 |
| 86 | Bell, | 42.550 | .108 | .019 | .044 |
| 92 | Logan, | 45.880 | .144 | .023 | .050 |
| 93 | Landis or Fuller—Lower level, | 44.900 | .272 | .023 | .051 |
| 85 | Shelly & Hoffer, | 37.575 | .120 | .023 | .061 |
| 91 | Mumper, | 38.100 | .100 | .024 | .063 |
| 89 | Longnecker—New opening, | 43.000 | .079 | .029 | .067 |
| 90 | Underwood, | 40.200 | .072 | .030 | .074 |
| 36 | Lime Kiln, | 48.100 | 2.572 | .040 | .083 |
| 2 | Richmond bog, | 40.550 | trace. | .036 | .088 |
| 10 | Stouffer, | 40.850 | trace. | .037 | .090 |
| 87 | McClure, | 45.000 | .028 | .047 | .104 |
| 14 | Garlic, | 52.912 | .079 | .056 | .105 |
| 33 | Pond No. 2, | 48.600 | 2.154 | .059 | .121 |
| 9 | Leib, | 35.200 | trace. | .046 | .130 |
| 16 | George Rock, | 40.450 | 1.023 | .054 | .133 |

| No. of ore bank. | Name of Ore Bank. | Per cent. iron. | Per cent. manganese. | Per cent. phosphorus. | Phosphorus in 100 parts iron. |
|---|---|---|---|---|---|
| 28 | Thomas Calliman, | 47.500 | 1.578 | .070 | .147 |
| 41 | Wiestling, | 54.950 | .324 | .087 | .158 |
| 56 | Calico—Rutherford, | 50.300 | .094 | .086 | .170 |
| 55 | Calico—Coover, | 47.550 | .094 | .086 | .180 |
| 1 | Bowers' furnace, | 47.000 | .410 | .085 | .180 |
| 25 | Mine No. 8—Mont Alto, | 54.200 | .569 | .100 | .184 |
| 39 | Promise, | 54.600 | .336 | .104 | .190 |
| 31 | Ruth, | 51.600 | .057 | .100 | .193 |
| 72 | J. C. Lehman No. 2, | 43.950 | .124 | .087 | .197 |
| 43 | Ahl—Pipe ore, | 55.150 | .165 | .114 | .206 |
| 37 | Guilford, | 52.500 | .663 | .114 | .217 |
| 42 | Wm. L. Chambers, | 53.000 | .057 | .117 | .220 |
| 40 | White Rock, | 47.962 | .477 | .109 | .227 |
| 30 | Lucy, | 48.050 | 1.772 | .110 | .228 |
| 11 | R. P. McFarland, | 35.750 | trace. | .087 | .243 |
| 54 | John Bridges, | 52.950 | .266 | .131 | .247 |
| 51 | John H. Cressler, | 48.850 | .245 | .146 | .298 |
| 44 | McHose, | 44.950 | 1.203 | .138 | .307 |
| 34 | Pond No. 1, | 50.550 | .309 | .157 | .312 |
| 27 | John Small, | 52.800 | .619 | .189 | .357 |
| 61 | Peffer, | 54.200 | .086 | .206 | .380 |
| 76 | Pepper, | 45.100 | .230 | .176 | .390 |
| 15 | Robert McCleary, | 52.950 | .403 | .215 | .406 |
| 29 | Jacob Rock, | 47.350 | .749 | .197 | .416 |
| 65 | Laurel No. 1, | 38.100 | 7.226 | .169 | .443 |
| 23 | Mine No. 4—Mont Alto, | 48 450 | 1.592 | .219 | .452 |
| 45 | Joseph Cressler, | 38.600 | .698 | .178 | .461 |
| 24 | Mine No. 5—Mont Alto, | 46.350 | 1.271 | .236 | .509 |
| 68 | Henry Clay No. 1, | 35.850 | 2.247 | .184 | .513 |
| 50 | Means, | 48.450 | 2.031 | .251 | .518 |
| 18 | Wyeth Douglas, | 43.700 | .165 | .263 | .601 |
| 46 | Jacob Koser, | 47.000 | 1.260 | .296 | .629 |
| 81 | Heck, | 44.500 | .309 | .289 | .649 |
| 63 | Pine Grove, | 42.150 | 2.709 | .275 | .652 |
| 22 | Mine No. 3—Mont Alto, | 42.450 | 2.543 | .281 | .661 |
| 4 | Beaver, | 42.400 | 1.441 | .282 | .665 |
| 70 | Koontz & Myers, | 34.500 | .453 | .235 | .681 |
| 26 | Benjamin George, | 47.750 | .872 | .338 | .708 |
| 3 | Old Mount Pleasant, | 47.500 | 2.334 | .339 | .713 |
| 59 | Big Pond, | 44.000 | 1.275 | .318 | .722 |
| 6*a* | Old Carrick furnace—*Wash*, | 36.400 | 1.758 | .267 | .733 |
| 82 | Coover & Wolf, | 45.500 | 1.304 | .342 | .751 |
| 57 | Chestnut, | 40.600 | .844 | .308 | .758 |
| 79 | Leidig & Hoffer, | 48.700 | .245 | .380 | .780 |
| 6 | Old Carrick furnace—*Lump*, | 45.300 | 1.102 | .355 | .783 |
| 8 | George Weinman, | 48.200 | 1.066 | .415 | .861 |
| 67 | Henry Clay No. 2, | 36.850 | 1.513 | .320 | .868 |
| 74 | Mullen, | 44.900 | 1.837 | .392 | .873 |
| 21 | Mill bank, | 48.250 | .180 | .439 | .909 |
| 19 | David Mentzer, | 46.900 | .094 | .442 | .942 |
| 32 | McNeal, | 46.250 | .432 | .437 | .944 |
| 68*a* | Henry Clay No. 1—*Lump*, | 50.250 | .072 | .513 | 1.020 |
| 38 | Hope, | 42.900 | .540 | .464 | 1.081 |
| 58 | George H. Clever, | 50.620 | 2.111 | .553 | 1.090 |
| 20 | Smith, Duncan & Avery, | 37.050 | .389 | .415 | 1.120 |
| 83 | C. H. Bender, | 45.050 | .410 | .511 | 1.134 |

| No. of ore bank. | Name of Ore Bank. | Per cent. iron. | Per cent. manganese. | Per cent. phosphorus. | Phosphorus in 100 parts iron. |
|---|---|---|---|---|---|
| 52 . . | George Clever, | 44.950 | .987 | .535 | 1.190 |
| 64 . . | Laurel No. 2, | 40.600 | 3.069 | .491 | 1.209 |
| 49 | Gochenauer & Rohrer, | 43.750 | 1.356 | .531 | 1.213 |
| 17 . . | Pass Orchard, | 37.750 | .093 | .469 | 1.242 |
| 53*a* | "No. 1 Clever," see note, page 16, | 47.900 | 5.987 | .663 | 1.384 |
| 12 . . | Webster, | 44.700 | .202 | .636 | 1.422 |
| 47 . . | Old Southampton, | 45.550 | .728 | .689 | 1.512 |
| 13 . . | Squire Stinger, | 39.500 | 4.791 | .606 | 1.534 |
| 66 . . | Henry Clay No. 3, | 41.350 | 1.253 | .666 | 1.610 |
| 48 . . | Ruby or Plaster, | 37.200 | 1.642 | .616 | 1.650 |
| 60 . . | Old Peach Orchard, | 44.950 | 1.693 | .746 | 1.659 |
| 69 . . | Diven tract, | 45.150 | .353 | .774 | 1.714 |
| 71*a* . | Grove—*Lump*, | 46.900 | 1.282 | .809 | 1.725 |
| 80 . . | Wolf, | 40.950 | .497 | .711 | 1.736 |
| 5 . . | Jennings Jones, | 41.050 | .396 | .744 | 1.812 |
| 78*a* . | Beltzhoover—Wash, | 36.950 | 1.347 | .740 | 2.003 |
| 84 . . | McCormick & Co.—Atticks, | 44.000 | 1.261 | .951 | 2.161 |
| 35 . . | English, | 38.350 | 3.134 | .849 | 2.213 |
| 78 . . | Beltzhoover,—Lump, | 40.900 | 2.594 | .909 | 2.222 |
| 71 . . | Grove—Wash, | 36.100 | 1.578 | .915 | 2.534 |
| 62 . . | Wild Cat, | 48.200 | .367 | 1.365 | 2.831 |
| 77 . . | Ege—Lump, | 34.350 | 4.539 | 1.079 | 3.141 |
| 75 . . | Strickler, | 42 950 | .093 | 1.392 | 3.240 |
| 77*a* . | Ege—Wash, | 32.150 | 3.112 | 1.059 | 3.293 |
| 73*a* . | Mount Holly, Medlar—Lump, | 48.500 | .727 | 1.619 | 3.338 |
| 7 . . | Railroad—Carrick, | 43.600 | .238 | 1.482 | 3.399 |
| 73 . . | Mount Holly—Medlar, | 38.250 | 2.730 | 1.373 | 3.589 |
| 53 . . | No. 1 Clever, | 36.800 | 5.620 | 1.787 | 4.856 |

The numbers in the left hand column of the above table indicate the geographical position of the ore banks on the map accompanying this report. A single glance will suffice to show how irregularly these numbers follow each other; and, since the analyses are arranged in the table on the basis of phosphorus in 100 parts iron, this great irregularity would seem to indicate that, except perhaps merely in a very general way (see Table II) there is no intimate relationship between the *geographical* position of the ore bank and the contents of phosphorus in the ore. It is true that lines drawn in a different direction, or on a *geological* basis, might show some such connection; but it is unsafe to assume, as is too frequently done, that ores located geographically near each other should carry about the same percentage of phosphorus. This point is very clearly brought out by compar-

ing analyses Nos. 6, 6*a* and 7; Nos. 45 and 46; Nos. 71 and 72 and Nos. 83 and 84.

The contents of phosphorus in samples of ore from different parts of the same bank will often be found to vary considerably. Indeed, numerous analyses made by me during the past ten years have fully convinced me on this point, as I have found samples taken from different places in the same ore bank to vary as much as .21, and that too in a bank whose average ore carries only a little over a quarter of one per cent. of phosphorus. This point becomes of importance to those who are mining ores for use in the manufacture of pig-iron for the Bessemer process, in which, as at present worked in this country, only a small percentage of phosphorus is admissible. It will be noticed from the preceding table that while only a few of the Cumberland Valley ores can be used *per se* for the manufacture of Bessemer pig-iron, there are a great many of them which could be used to advantage as an admixture along with less phosphoric ores.

It will be interesting to mention here a recent discovery in metallurgy by which dephosphorization of pig-iron can be accomplished in the Bessemer converter. This is the so-called Thomas-Gilchrist or basic process. It consists simply in lining the converter with a non-silicious material consisting chiefly of lime, magnesia and alumina, and by adding a small quantity of lime to the pig-iron during the process of conversion. By this means a basic cinder is produced which carries off practically the whole of the phosphorus. Experiments have fairly demonstrated the fact that by using this process a *good quality of steel can now be made from pig-iron containing over two per cent. of phosphorus.* The practical effect of the introduction of this process on a large scale will be that, since a good quality of steel can now be made from pig-iron high in phosphorus, those ores which have hitherto been neglected on account of their high percentage of phosphorus, will now be largely mined. Many of the ores of the Cumberland Valley are peculiarly adapted for the manufacture of pig-iron intended for conversion into steel by the "basic process;" and as they occur in great

abundance and can be economically mined their rapid development in the near future should be assured.

It will be interesting to obtain a general idea of the average character of the ores in the different districts. I have therefore prepared the following Table II in which the averages of a number of samples from each district are given. In preparing the table I have selected only the well developed banks for each different group, excluding all analyses of samples from mere trial shafts or pits, as it is believed that this plan will show better the average character of the ores as at present developed.

Table III will show the extreme limits of variation in the different elements included in Table II.

TABLE II.

*Average per centage* of Iron, Manganese and Phosphorus in certain groups of ore. [Cumberland Valley:]

| No. of samples. | | Name of Group. | Iron. | Manganese. | Total iron and manganese. | Phosphorus. | Phosphorus in 100 parts iron. |
|---|---|---|---|---|---|---|---|
| 6 | I. | South Pennsylvania R.R. *Brown Hematites*, | 44.341 | 1.009 | 45.350 | .522 | 1.177 |
| 4 | II. | South Pennsylvania R.R. *Bog ores*, | 38.087 | trace. | 38.087 | .051 | .133 |
| 13 | III. | Mont Alto Railroad, | 46.054 | 1.114 | 47.168 | .268 | .581 |
| 6 | IV. | Shippensburg "*Limestone ores*," | 46.208 | .599 | 46.807 | .155 | .335 |
| 8 | V. | Shippensburg "*Mountain ores*," | 42.933 | 1.820 | 44.753 | .667 | 1.553 |
| 12 | VI. | South Mountain Railroad, | 40.083 | 2.057 | 42.140 | .537 | 1.334 |
| 4 | VII. | Boiling Springs, | 36.087 | 2.898 | 38.985 | .947 | 2.624 |
| 3 | VIII. | Dogwood Run (Dillsburg), *Brown Hematites*, | 43.650 | .703 | 44.353 | .447 | 1.024 |
| 6 | IX. | Dillsburg *Magnetites*, | 43.875 | .102 | 43.977 | .028 | .063 |

Group I includes analyses Nos. 1, 3, 4, average of 6 and 6*a*, 7 and 12.

Group II includes analyses Nos. 2, 9, 10 and 11.

Group III includes analyses Nos. 15, 16, 18, 20, 21, 22, 23, 24, 25, 29, 33, 34 and 35.

Group IV includes analyses Nos. 44, 45, 46, 51, 55 and 56.

Group V includes analyses Nos. 47, 48, 49, 52, 53, 57, 58 and 59.

Group VI includes analyses Nos. 63, 64, 65, 66, 67, 68, 70, average of 71 and 71*a*, 72, 73, 74 and 75.

Group VII includes analyses Nos. 77, 77*a*, 78 and 78*a*.

Group VIII includes analyses Nos. 80, 81, 82.

Group IX includes analyses Nos. 86, 87, 89, 90, 92 and average of 93 and 93*a*.

TABLE III.

*Extreme limits of variation* in the percentages of Iron, Manganese and Phosphorus given in Table II.

| No. of Group. | Iron. | Manganese. | Phosphorus. |
|---|---|---|---|
| I, | 40.85 to 47.50 | .202 to 2.334 | .085 to 1.482 |
| II, | 35.20 to 40.85 | trace. | .036 to .087 |
| III, | 37.05 to 54.20 | .165 to 3.134 | .054 to .849 |
| IV, | 38.60 to 50.30 | .094 to 1.260 | .086 to .296 |
| V, | 36.80 to 50.62 | .728 to 5.620 | .308 to 1.787 |
| VI, | 34.50 to 44.90 | .093 to 7.226 | .087 to 1.392 |
| VII, | 32.15 to 40.90 | 1.347 to 4.539 | .740 to 1.079 |
| VIII, | 40.95 to 45.50 | .309 to 1.304 | .289 to .711 |
| IX, | 40.20 to 46.62 | .028 to .182 | .019 to .047 |

*Notes.*

*1.* It will be interesting here to notice the occurrence of a peculiar variety of iron ore in the Grove bank, near Hunter's Run Station, Cumberland county. It has the *general appearance* of a *micaceous red hematite*, and has undoubtedly been frequently mistaken for this variety of ore. It occurs in fibrous radiating masses, sometimes coating the ordinary brown hematite, and occasionally in separate small lumps. A partial analysis of a tolerably pure specimen of the ore is given herewith; and in order to make its analysis more striking, the analysis of the ore with which it is found associated is given for comparison.

| | "*Grove lump ore.*" | "*Red, fibrous variety.*" |
|---|---|---|
| Sesquioxide of iron, | 67.000 | 80.714 |
| Sesquioxide of manganese, | 1.841 | 3.973 |
| Sesquioxide of cobalt, | .170 | .090 |
| Alumina, | 3.910 | 2.427* |

* Undetermined matter.

| | | |
|---|---|---|
| Lime, | .210 | .030 |
| Magnesia, | .183 | .129 |
| Sulphuric acid, | .007 | none. |
| Phosphoric acid, | 1.852 | .210 |
| Water, | 10.870 | 11.605 |
| Silicious matter, | 13.370 | .822 |
| | 99.413 | 100.000 |
| Metallic iron, | 46.900 | 56.500 |
| Metallic manganese, | 1.282 | 2.766 |
| Sulphur, | .003 | none. |
| Phosphorus, | .809 | .092 |
| Phosphorus in 100 parts iron, | 1.725 | .163 |

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*2.* In several of the "limestone ore" banks near Shippensburg quite a quantity of "sand" is sometimes found among the wash ore. Where the amount is excessive it is usually separated by screening. It consists generally of more or less rounded *quartz grains mixed with small pieces of iron ore.* This latter is frequently slightly magnetic, and its occurrence in this particular locality is interesting, as Dr. Genth observed the same conditions in his examination of some of the limestone ores from Center county. A sample of the sand from the Calico bank (Rutherford opening) was examined with the following results:

| | *"Sand."* | *"Magnetic portion."* | *"Non-magnetic portion."* |
|---|---|---|---|
| Protoxide of iron, | .171 | .502 | none. |
| Sesquioxide of iron, | 54.381 | 83.027 | 38.571 |
| Sesquioxide of manganese, | .258 | .392 | .197 |
| Sesquioxide of cobalt, | .040 | .030 | .050 |
| Alumina, | 3.662 | 4.753 | 3.157 |
| Lime, | .870 | .400 | .980 |
| Magnesia, | .317 | .407 | .304 |
| Sulphuric acid, | .050 | .050 | .072 |
| Phosphoric acid, | .281 | .343 | .231 |
| Water, | 4.430 | 2.546 | 5.288 |
| Silicious matter, | 35.540 | 7.550 | 51.150 |
| | 100.000 | 100.000 | 100.000 |
| Metallic iron, | 38.200 | 58.510 | 27.000 |
| Metallic manganese, | .180 | .273 | .137 |
| Sulphur, | .020 | .020 | .029 |
| Phosphorus, | .123 | .150 | .101 |
| Phosphorus in 100 parts iron, | .322 | .256 | .374 |

*3.* Samples of the ores from different localities were tested for metals of unusual occurrence. *Chromium* was not detected in any specimen. In some of the ores a minute quantity of *zinc* was noticed; but the amount was so exceedingly small that a separate determination of it was not thought necessary. An occasional trace of *baryta* was found, especially in the ores which carried a large percentage of *manganese.* With the exception of the "Garlic" ore not a trace of *iron pyrites* was found in any of the samples, although each one was separately examined for this compound.

In the "Garlic" ore a small quantity of *arsenic* was detected. The ore was supposed to contain a large amount of this element, and it is said that the bank was abandoned on this account.

*4.* Nearly all the samples from the different ore banks in the Cumberland Valley were selected by myself; and the specimens were so taken as to give as fair a representation of the average character of the ore as was possible under the circumstances. The number of pieces constituting each sample and the part of the bank from which they were taken are given with each analysis, so that a proper estimate can be made of the examination. All the analyses were made of the ore in the *dry state;* and this important point should be borne in mind in determining the value of the ore. As usually mined and shipped it carries quite a large percentage of *hygroscopic water*—sometimes as much as 10 to 12 per cent.—which materially decreases the percentage of metallic iron as compared with the dry ore.

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In connection with the iron industries of the Cumberland Valley the following list of the blast furnaces in the district will be in place. It is taken from Mr. James Swank's "Directory to the Iron and Steel Works of the United States," published in 1880.

*Franklin County.*

*Mont Alto furnace*, Mont Alto Iron Co., Mont Alto. One

stack, 37½×9½, built in 1808; cold and warm blast; open top; ore, exclusively neutral brown hematite, from the furnace property, which consists of 20,000 acres of land; the pig-iron is used for car-wheels and blooms; annual capacity, 5,600 net tons. Brand, "Mont Alto." I. S. Waterman, president; Geo. B. Wiestling, superintendent. Fuel, charcoal.

*Chambersburg furnace*, C. Burkhart & Co., Chambersburg. One stack building, 40×9, to be completed in May, 1880; closed top; cold blast; ore, local hematite; specialty, car-wheel pig-iron; annual capacity, 3,000 net tons. Brand, "Chambersburg." Fuel, charcoal.

*Richmond furnace*, R. T. Ryon & Co., Richmond furnace. One stack, 36×9½, built in 1865 and rebuilt in 1875; open top; fuel, anthracite and coke; ores, from the Richmond mines, two miles from the furnace; annual capacity, 5,500 net tons. Formerly called Mount Pleasant Iron Works.

*Carrick furnace*, Bland & Spang, Carrick furnace. One stack 37×9, built in 1828; ore, local hematite; product, first class car-wheel pig-iron; annual capacity, 2,800 net tons. Fuel, charcoal.

*Franklin furnace*, Hunter & Springer, St. Thomas. One stack, 32×7½, built in 1828; cold blast; ore, Cumberland Valley brown hematite; product, car-wheel pig-iron; annual capacity, 1,500 net tons. Brand, "Franklin." Fuel, charcoal.

*Cumberland County.*

*Big Pond furnace*, Philadelphia and Reading Coal and Iron Company, Newville. One stack, 33×8½, built in 1836. Fuel, charcoal.

*Carlisle Iron Works*, C. W. Ahl & Son, Carlisle. Works at Boiling Springs. One stack, 28×8½, built in 1798 and rebuilt in 1815; hot blast; closed top; water power; limestone and mountain ore; specialty, neutral forge pig-iron; annual capacity, 1,600 net tons. Brand, Carlisle.

*Pine Grove furnace*, South Mountain Mining and Iron Company, Pine Grove furnace. One stack, 45×9⅓, built in 1770; remodeled in 1877; hot blast; bell and hopper top;

ores, hematite procured on the furnace property, which comprises 27,000 acres of land. The furnace has been worked during the winter for the past two years on coke and anthracite coal, the remainder of the year on charcoal. Pig-iron is used for blooms. Annual capacity, 5,000 net tons.

In addition to the above there is a blast furnace now being built at Cleversburg by George Clever & Sons, which is expected to be in blast in a few months.

REPORT OF PROGRESS

IN THE

# CHEMICAL LABORATORY AT HARRISBURG,

## 1879, 1880.

BY ANDREW S. McCREATH.

## CHAPTER I.

### IRON ORES.

*Franklin County.*

| | (1) *Bower's furnace.* | (2) *Richmond bog bank.* | (3) *Old Mt. Pleasant.* | (4) *Beaver.* |
|---|---|---|---|---|
| Protoxide of iron, | none. | .337 | none. | none. |
| Sesquioxide of iron, | 67.142 | 57.554 | 67.857 | 60.571 |
| Sesquioxide of manganese, | .589 | trace. | 3.352 | 2.069 |
| Sesquioxide of cobalt, | .390 | trace. | .200 | .130 |
| Alumina, | 1.998 | 2.100 | 2.887 | 3.470 |
| Lime, | .500 | .120 | .740 | .700 |
| Magnesia, | .252 | .115 | .612 | .547 |
| Sulphuric acid, | .290 | .925 | .130 | .112 |
| Phosphoric acid, | .194 | .082 | .776 | .646 |
| Water and organic matter, | 11.754 | 14.518 | 12.030 | 11.572 |
| Silicious matter, | 17.280 | 24.530 | 11.670 | 19.530 |
| | 100.389 | 100.281 | 100.254 | 99.347 |
| Metallic iron, | 47.000 | 40.550 | 47.500 | 42.400 |
| Metallic manganese, | .410 | trace. | 2.334 | 1.441 |
| Sulphur, | .116 | .370 | .052 | .045 |
| Phosphorus, | .085 | .036 | .339 | .282 |
| Phosphorus in 100 parts iron, | .180 | .088 | .713 | .665 |

(*1*) *Bower's furnace ore bank*, on Mrs. Eliza Furray's farm, nine miles southwest of Mercersburg, Warren township. *Brown hematite of VIII.*

Sample consisted of 118 pieces taken from workings 1000′ in length; shafts mostly shallow.

(2) *Richmond furnace bog bank*, about one mile northwest of furnace. *Bog ore* of III.

Sample consisted of 79 pieces taken from ore pit at different places.

(3) *Old Mt. Pleasant bank*, near Richmond furnace. *Lump* and *wash ore.*

Sample consisted of 445 pieces taken from pile of ore prepared for shipment.

(4) *Beaver bank*, about two miles northwest of Richmond furnace. *Lump* and *wash ore.*

Sample consisted of 450 pieces taken from pile of ore prepared for shipment.

*Franklin County.*

| | (5) *Jennings Jones.* | (6) *Old Carrick furnace.* | (6a) *Old Carrick furnace.* | (7) *Railroad bank.* |
|---|---|---|---|---|
| | | *Lump ore.* | *Wash ore.* | |
| Sesquioxide of iron, | 58.643 | 64.714 | 52.000 | 62.285 |
| Sesquioxide of manganese, | .568 | 1.582 | 2.543 | .342 |
| Sesquioxide of cobalt, | .030 | .170 | .280 | .280 |
| Alumina, | 3.923 | 2.723 | 5.709 | 2.620 |
| Lime, | .760 | .450 | .620 | .560 |
| Magnesia, | .378 | .796 | .994 | .493 |
| Sulphuric acid, | .157 | .120 | .137 | .012 |
| Phosphoric acid, | 1.704 | .813 | .611 | 3.394 |
| Water and organic matter, | 11.885 | 11.610 | 10.668 | 11.132 |
| Silicious matter, | 22.000 | 16.280 | 26.050 | 18.500 |
| | 100.048 | 99.258 | 99.612 | 99.618 |
| Metallic iron, | 41.050 | 45.300 | 36.400 | 43.600 |
| Metallic manganese, | .396 | 1.102 | 1.758 | .238 |
| Sulphur, | .063 | .048 | .055 | .005 |
| Phosphorus, | .744 | .355 | .267 | 1.482* |
| Phosphorus in 100 parts iron, | 1.812 | .783 | .733 | 3.399 |

(5) *Jennings Jones' bank*, four miles north of Richmond furnace.

Sample, selected by Mr. William Burgess, consisted of thirty pieces taken from different parts of mine.

(6) *Old Carrick furnace bank*, one and three fourth miles west of Fannettsburg, Metal township. *Lump ore.*

* Average of two determinations.

Sample consisted of 149 pieces taken from ore pile at furnace.

(6a) *Old Carrick furnace bank.* Unwashed *fine ore.*

Sample consisted of 185 pieces taken from ore pile at furnace.

(7) *Railroad bank*, about one and three fourth miles west of Fannettsburg, Metal township ; 200 feet north of old Carrick furnace bank.

Sample consisted of 78 pieces taken from ore pile at furnace.

*Franklin County.*

| | (8) Geo. Weinman. | (9) Leib. | (10) Stouffer. | (11) McFarland. |
|---|---|---|---|---|
| Protoxide of iron, | none. | .176 | .192 | .128 |
| Sesquioxide of iron, | 68.857 | 50.090 | 58.142 | 50.928 |
| Sesquioxide of manganese, | 1.531 | trace. | trace. | trace. |
| Sesquioxide of cobalt, | .390 | trace. | trace. | trace. |
| Alumina, | 2.573 | 5.790 | 3.649 | 5.520 |
| Lime, | .670 | .300 | .720 | .640 |
| Magnesia, | .522 | .342 | .371 | .421 |
| Sulphuric acid, | .175 | .872 | .742 | .887 |
| Phosphoric acid, | .950 | .105 | .084 | .199 |
| Water and organic matter, | 11.592 | 13.896 | 15.378 | 14.680 |
| Silicious matter, | 12.940 | 27.840 | 20.030 | 26.720 |
| | 100.200 | 99.411 | 99.308 | 100.123 |
| Metallic iron, | 48.200 | 35.200 | 40.850 | 35.750 |
| Metallic manganese, | 1.066 | trace. | trace. | trace. |
| Sulphur, | .070 | .349 | .297 | .355 |
| Phosphorus, | .415 | .046 | .037 | .087 |
| Phosphorus in 100 parts iron, | .861 | .130 | .090 | .243 |

(8) *George Weinman's bank*, one and one half miles northwest of Fannettsburg, Metal township. *Surface ore.*

Sample consisted of 156 pieces taken from ore found around opening.

(9) *Leib bank*, (J. S. Whitmer & Co.,) two miles east of Mercersburg. *Bog ore* in III.

Sample consisted of 94 pieces taken from ore pile.

(10) *Jacob Stouffer's bank*, one mile east of Mercersburg, Montgomery township. *Bog ore* in III.

Sample consisted of 129 pieces taken from ore pit at different places.

(11) *R. P. McFarland's bank*, one and one half miles east of Mercersburg, Peters township. *Bog ore* in III.

Sample consisted of 133 pieces taken from ore pile.

*Franklin County.*

| | (12) *Webster.* | (13) *Stinger.* |
|---|---|---|
| Sesquioxide of iron, | 63.857 | 56.428 |
| Sesquioxide of manganese, | .290 | 6.881 |
| Sesquioxide of cobalt, | .510 | .390 |
| Alumina, | 3.277 | 2.874 |
| Lime, | .710 | .630 |
| Magnesia, | .299 | .670 |
| Sulphuric acid, | .135 | .105 |
| Phosphoric acid, | 1.456 | 1.388 |
| Water and organic matter, | 11.840 | 12.120 |
| Silicious matter, | 17.250 | 18.810 |
| | 99.624 | 100.296 |
| Metallic iron, | 44.700 | 39.500 |
| Metallic manganese, | .202 | 4.791 |
| Sulphur, | .054 | .042 |
| Phosphorus, | .636 | .606 |
| Phosphorus in 100 parts iron, | 1.422 | 1.534 |

(*12*) *Webster bank*, (Smith, Duncan & Avery,) two miles west, north west of Mercersburg.

Sample consisted of 83 pieces taken from ore pile at bank.

(*13*) *Squire Stinger's old bank*, one mile east of Loudon, Peters township.

Sample consisted of 138 pieces taken from dump of five or six shafts.

*Franklin County.*

| | (14) *Garlic Bank.* |
|---|---|
| Bisulphide of iron, | .133 |
| Sesquioxide of iron, | 75.500 |
| Sesquioxide of manganese, | .113 |
| Sesquioxide of cobalt, | .120 |
| Alumina, | 3.363 |
| Lime, | .830 |
| Magnesia, | .338 |
| Sulphuric acid, | .197 |
| Phosphoric acid, | .128 |
| Arsenic acid, | .022 |
| Water and organic matter, | 12.908 |
| Silicious matter, | 6.890 |
| | 100.542 |
| Metallic iron, | 52.912 |
| Metallic manganese, | .079 |
| Sulphur, | .150 |
| Phosphorus, | .056 |
| Phosphorus in 100 parts iron, | .105 |

(*14*) *Garlic bank*, two and one half miles south west of St. Thomas.

Sample consisted of 63 pieces taken from ore found around opening.

*Franklin County.*

| | (*15*) *McCleary.* | (*16*) *Geo. Rock.* | (*17*) *Pass Orchard.* | (*18*) *Douglas.* |
|---|---|---|---|---|
| Sesquioxide of iron, | 75.642 | 57.785 | 53.928 | 62.428 |
| Sesquioxide of manganese, | .579 | 1.469 | .133 | .237 |
| Sesquioxide of cobalt, | .180 | .130 | .190 | trace. |
| Alumina, | 2.166 | 2.985 | 1.980 | 1.500 |
| Lime, | .640 | .590 | .600 | .110 |
| Magnesia, | .432 | .331 | .576 | .395 |
| Sulphuric acid, | .065 | .072 | .065 | .087 |
| Phosphoric acid, | .492 | .123 | 1.074 | .602 |
| Water and organic matter, | 11.928 | 10.510 | 8.858 | 9.392 |
| Silicious matter, | 8.500 | 25.470 | 32.560 | 25.570 |
| | 100.624 | 99.465 | 99.964 | 100.321 |
| Metallic iron, | 52.950 | 40.450 | 37.750 | 43.700 |
| Metallic manganese, | .403 | 1.023 | .093 | .165 |
| Sulphur, | .026 | .029 | .026 | .035 |
| Phosphorus, | .215 | .054 | .469 | .263 |
| Phosphorus in 100 parts iron, | .406 | .133 | 1.242 | .601 |

(*15*) *Robert McCleary's bank*, one and one half miles north of Mt. Hope, Quincy township.

Sample consisted of 244 pieces taken from ore lying around bank.

(*16*) *George Rock's bank*, three miles south of Mont Alto, or one mile south east of Quincy.

Sample consisted of 63 pieces taken from ore in place at different parts of the bank. Mine not in operation at date of visit. Bank about 50′ diameter, and from 4′ to 10′ deep.

(*17*) *Pass Orchard bank*, one and one half miles east of Quincy, in Bissecker Gap, Mont Alto estate.

Sample consisted of 165 pieces taken from ore at various pits sunk prior to 1864. Bank not worked.

(*18*) *Wyeth Douglas bank*, one mile north east of Quincy, near Mt. Airy.

Sample, selected by Mr. A. E. Lehman, consisted of several large pieces. No fresh sample was taken from this bank, as upon examination it was thought that the above

analysis, made in 1879, fairly represented the character of the ore.

*Franklin County.*

| | (19) *Mentzer.* | (20) *Smith, Duncan & Avery.* | (21) *Mill bank.* |
|---|---|---|---|
| Sesquioxide of iron, | 67.000 | 52.928 | 68.928 |
| Sesquioxide of manganese, | .135 | .558 | .258 |
| Sesquioxide of cobalt, | .160 | .090 | .240 |
| Alumina, | 1.567 | 3.035 | 1.927 |
| Lime, | .780 | .590 | .870 |
| Magnesia, | .371 | .450 | .230 |
| Sulphuric acid, | .032 | .055 | .188 |
| Phosphoric acid, | 1.012 | .950 | 1.005 |
| Water and organic matter, | 10.102 | 9.665 | 10.656 |
| Silicious matter, | 18.250 | 31.700 | 15.200 |
| | 99.409 | 100.021 | 99.502 |
| Metallic iron, | 46.900 | 37.050 | 48.250 |
| Metallic manganese, | .094 | .389 | .180 |
| Sulphur, | .013 | .022 | .075 |
| Phosphorus, | .442 | .415 | .439 |
| Phosphorus in 100 parts iron, | .942 | 1.120 | .909 |

(*19*) *David Mentzer opening*, one and one fourth miles south-west of Altodale, (Funkstown.)

Sample consisted of 91 pieces selected from ore lying around openings.

(*20*) *Smith, Duncan & Avery's bank*, one mile west of Mont Alto. *Lump* and *wash* ore.

Sample consisted of 478 pieces taken from ore pile as prepared for shipment.

Mine worked by open cut. Has probably shipped over 5,000 tons ore.

(*21*) *Mill bank*, (Mont Alto Iron Co.,) about 300 yards west of furnace at Mont Alto.

Sample consisted of 125 pieces taken from ore pile at washer.

This bank is an open excavation, 20 feet deep from surface, 60′×80′. About 1,500 tons of ore mined from it prior to January, 1881.

*Franklin County.*

| | (22) | (23) | (24) | (25) |
|---|---|---|---|---|
| | *Mont Alto Iron Company.* | | | |
| | *Mine No. 3.* | *Mine No. 4.* | *Mine No. 5.* | *Mine No. 8.* |
| Sesquioxide of iron, | 60.642 | 69.214 | 66.214 | 77.428 |
| Sesquioxide of manganese, | 3.652 | 2.287 | 1.825 | .817 |
| Sesquioxide of cobalt, | .250 | .250 | .220 | .370 |
| Alumina, | 2.695 | 1.605 | 2.126 | 1.243 |
| Lime, | .760 | .650 | .510 | .600 |
| Magnesia, | .681 | .486 | .490 | .324 |
| Sulphuric acid, | .110 | .047 | .065 | .169 |
| Phosphoric acid, | .643 | .501 | .540 | .229 |
| Water and organic matter, | 11.065 | 11.515 | 10.920 | 10.607 |
| Silicious matter, | 18.870 | 13.070 | 16.750 | 7.870 |
| | 99.368 | 99.625 | 99.660 | 99.657 |
| Metallic iron, | 42.450 | 48.450 | 46.350 | 54.200 |
| Metallic manganese, | 2.543 | 1.592 | 1.271 | .569 |
| Sulphur, | .044 | .019 | .026 | .067 |
| Phosphorus, | .281 | .219 | .236 | .100 |
| Phosphorus in 100 parts iron, | .661 | .452 | .509 | .184 |

(*22*) *Mine No. 3*, (Mont Alto Iron Co.,) one fourth mile east of Mont Alto furnace.

Sample consisted of 200 pieces taken from ore in place at different parts of shaft.

Mine both open and underground work. Opened prior to 1864, but idle from 1865 to 1879. Capacity, about 70 tons per day.

(*23*) *Mine No. 4*, (Mont Alto Iron Co.,) three fourths mile east, north-east of Mont Alto furnace.

Sample consisted of 210 pieces taken from pile of ore mined for furnace use at Mont Alto.

This mine is both open and underground work. It has supplied over 100,000 tons of ore to Mont Alto furnace. Deepest point of work below surface, 230 feet; length of mine, 1,800 feet; width of mine, 35 feet.

(*24*) *Mine No. 5*, (Mont Alto Iron Co.,) three fourths mile east, north-east of Mont Alto furnace.

Sample consisted of 75 pieces taken from ore lying around mine.

This mine is worked both open and underground; worked to 50 feet deep from surface. Has furnished about 5,000 tons of ore.

(*25*) *Mine No. 8*, (Mont Alto Iron Co.,) one and one fourth miles north, 38° east, from Mont Alto furnace.

Sample consisted of 197 pieces taken from pile of ore at mine.

Excavation 200′ long, 50′ wide, and 25′ deep.

*Franklin County.*

| | (*26*) *Benj. George.* | (*27*) *John Small.* | (*28*) *Thos. Calliman.* |
|---|---|---|---|
| Sesquioxide of iron, . . | 68.214 | 75.428 | 67.857 |
| Sesquioxide of manganese, . | 1.252 | .889 | 2.266 |
| Sesquioxide of cobalt, . . | .280 | .260 | .070 |
| Alumina, . . . . . | 1.182 | 1.366 | 2.663 |
| Lime, . . . . . | .670 | .730 | .360 |
| Magnesia, . . . . . | .252 | .414 | .353 |
| Sulphuric acid, . . . . . | .100 | .070 | .047 |
| Phosphoric acid, . . . . . | .774 | .432 | .160 |
| Water and organic matter, . | 11.860 | 11.780 | 11.284 |
| Silicious matter, . . . . . | 14.990 | 8.920 | 14.510 |
| | 99.574 | 100.289 | 99.570 |
| Metallic iron, . . . . . | 47.750 | 52.800 | 47.500 |
| Metallic manganese, . . . | .872 | .619 | 1.578 |
| Sulphur, . . . . . | .040 | .028 | .019 |
| Phosphorus, . . . . . | .338 | .189 | .070 |
| Phosphorus in 100 parts iron, | .708 | .357 | .147 |

(*26*) *Benjamin George deposit*, one and one quarter miles northeast of Altodale. *Surface ore.*

Sample consisted of 41 pieces selected from surface ore of deposit.

(*27*) *John Small bank*, one and three quarter miles north of Mont Alto furnace; 500 yards east of the Shiery farm.

Sample consisted of 74 pieces taken from ore lying around opening.

Open excavation 35′ long, 25′ wide and 10′ deep. Product about 250 tons.

(*28*) *Thomas Calliman bank*, about one half mile east from Pond No. 1 bank.

Sample consisted of 75 pieces taken from ore lying around openings.

Four pits sunk on this deposit to test the quantity and quality. No large quantity mined.

*Franklin County.*

| | (29) *Jacob Rock.* | (30) *Lucy.* | (31) *Ruth.* | (32) *McNeal.* |
|---|---|---|---|---|
| Sesquioxide of iron, | 67.642 | 68.642 | 73.714 | 66.071 |
| Sesquioxide of manganese, | 1.075 | 2.545 | .082 | .620 |
| Sesquioxide of cobalt, | .160 | trace. | trace. | .120 |
| Alumina, | 1.458 | 3.250 | 1.650 | 2.629 |
| Lime, | .700 | .740 | .830 | .630 |
| Magnesia, | .166 | .309 | .137 | .295 |
| Sulphuric acid, | .165 | .040 | .030 | .082 |
| Phosphoric acid, | .451 | .252 | .229 | 1.000 |
| Water and organic matter, | 11.586 | 11.692 | 11.522 | 12.062 |
| Silicious matter, | 16.020 | 12.100 | 11.910 | 15.940 |
| | 99.423 | 99.571 | 100.104 | 99.449 |
| Metallic iron, | 47.350 | 48.050 | 51.600 | 46.250 |
| Metallic manganese, | .749 | 1.772 | .057 | .432 |
| Sulphur, | .066 | .016 | .012 | .033 |
| Phosphorus, | .197 | .110 | .100 | .437 |
| Phosphorus in 100 parts iron, | .416 | .228 | .193 | .944 |

(*29*) *Jacob Rock's bank*, three miles north of Mont Alto furnace. *Lump* and *wash ore.*

Sample consisted of 288 pieces taken from pile of ore prepared for shipment.

Mine worked by a shaft 105′ deep. Has furnished about 2,000′ tons of ore.

(*30*) *Lucy mine*, (Mont Alto Iron Co.) two and one half miles north from Mont Alto.

Sample consisted of about 50 pieces taken from ore mined from a number of test pits.

Private analysis made for Mont Alto Iron Co., and published by permission of Mr. George B. Wiestling, Supt.

(*31*) *Ruth mine*, (Mont Alto Iron Co.,) one half mile west of the Lucy mine.

Sample consisted of about 50 pieces taken from ore mined from various test pits.

Private analysis published by permission of Mr. George B. Wiestling, superintendent Mont Alto Iron Works.

(*32*) *McNeal bank*, (McCormick & Co.,) about three miles north of Mont Alto.

Sample consisted of 131 pieces taken from ore lying at opening and near it.

Mine not in operation.

*Franklin County.*

| | (33) *Pond No. 2.* | (34) *Pond No. 1.* |
|---|---|---|
| Sesquioxide of iron, | 69.428 | 72.214 |
| Sesquioxide of manganese, | 3.094 | .441 |
| Sesquioxide of cobalt, | .320 | trace. |
| Alumina, | 1.627 | 1.644 |
| Lime, | .800 | .940 |
| Magnesia, | .277 | .324 |
| Sulphuric acid, | .120 | .135 |
| Phosphoric acid, | .135 | .362 |
| Water and organic matter, | 12.062 | 12.630 |
| Silicious matter, | 11.680 | 11.520 |
| | 99.543 | 100.210 |
| Metallic iron, | 48.600 | 50.550 |
| Metallic manganese, | 2.154 | .309 |
| Sulphur, | .048 | .054 |
| Phosphorus, | .059 | .157–158 |
| Phosphorus in 100 parts iron, | .121 | .312 |

(*33*) *Pond No. 2 bank*, three miles north, northeast of Mont Alto, on Mont Alto estate.

Sample consisted of 218 pieces taken from ore lying around mine.

Mine not in operation at date of visit. Open excavation 110′×90′, and about 10′ deep. Worked prior to 1864, and ore used at Mont Alto furnace. Since 1864 a shaft was sunk and about 2,000 tons of ore mined at depth of 90 feet from surface.

(*34*) *Pond No. 1 bank*, three miles north, northeast of Mont Alto, on Mont Alto estate.

Sample consisted of 175 pieces taken from ore lying around mine. Not in operation at date of visit. 163 pieces selected by Mr. George B. Wiestling since mine has been operated gave: Metallic iron, 48.500; phosphorus, .149; water, 11.935; silicious matter, 13.930; phosphorus in 100 parts iron, .306.

This is an open excavation 300′×150′, and varying in depth from 8′ to 30′.

Quantities of ore were mined here prior to 1864. Laid idle from 1864 until the fall of 1880, when work re-commenced.

*Franklin County.*

| | (35) *English.* | (36) *Lime Kiln.* | (37) *Guilford.* |
|---|---|---|---|
| Sesquioxide of iron, | 54.785 | 68.714 | 75.000 |
| Sesquioxide of manganese, | 4.501 | 3.694 | .952 |
| Sesquioxide of cobalt, | .230 | .170 | .050 |
| Alumina, | 4.381 | 1.605 | 2.150 |
| Lime, | .280 | .830 | .480 |
| Magnesia, | .454 | .299 | .216 |
| Sulphuric acid, | .037 | .092 | .047 |
| Phosphoric acid, | 1.944 | .091 | .261 |
| Carbonic acid, | .046 | none. | none. |
| Water and organic matter, | 11.742 | 11.200 | 11.812 |
| Silicious matter, | 21.510 | 12.790 | 9.110 |
| | 99.910 | 99.485 | 100.078 |
| Metallic iron, | 38.350 | 48.100 | 52.500 |
| Metallic manganese, | 3.134 | 2.572 | .663 |
| Sulphur, | .015 | .036 | .019 |
| Phosphorus, | .849 | .040 | .114 |
| Phosphorus in 100 parts iron, | 2.213 | .083 | .217 |

(*35*) *English mine*, two miles southeast of Greenwood.

Sample consisted of 138 pieces taken from ore in place at various parts of mine.

Opening about 150′×100′×20′ deep.

(*36*) *Lime Kiln bank*, two and a half miles north of Mont Alto furnace.

Sample consisted of 125 pieces taken from ore lying around opening.

Open and underground. Open work say 25′ diameter and 8′ deep. Underground 40′ deep. Probably about 400 tons taken from mine.

(*37*) *Guilford bank*, two and a half miles south of Greenwood, two and a half miles northeast of Altodale, or two and a half miles north, 25° east of Mont Alto.

Sample consisted of 128 pieces taken from ore lying in and around bank.

Open excavation 75′ long, 30′ wide and 18′ deep. This is surrounded with probably 10 test pits.

*Franklin County.*

| | (38) *Hope.* | (39) *Promise.* | (40) *White Rock.* | (41) *Wiestling.* |
|---|---|---|---|---|
| Sesquioxide of iron, | 61.285 | 78.000 | 68.517 | 78.500 |
| Sesquioxide of manganese, | .775 | .483 | .685 | .465 |
| Sesquioxide of cobalt, | trace. | trace. | trace. | .210 |
| Alumina, | 3.143 | 1.982 | 2.968 | 1.754 |
| Lime, | .720 | .470 | .440 | .530 |
| Magnesia, | .306 | .248 | .349 | .227 |
| Sulphuric acid, | .022 | .092 | .092 | .092 |
| Phosphoric acid, | 1.062 | .238 | .250 | .199 |
| Water and organic matter, | 10.788 | 12.610 | 12.190 | 12.440 |
| Silicious matter, | 21.480 | 5.775 | 14.320 | 4.950 |
| | 99.581 | 99.898 | 99.811 | 99.367 |
| Metallic iron, | 42.900 | 54.600 | 47.962 | 54.950 |
| Metallic manganese, | .540 | .336 | .477 | .324 |
| Sulphur, | .009 | .037 | .037 | .036 |
| Phosphorus, | .464 | .104 | .109 | .087 |
| Phosphorus in 100 parts iron, | 1.081 | .190 | .227 | .158 |

(*38*) *Hope mine*, (Mont Alto Iron Co.,) 200 yards west of the Promise mine; or about three miles north, 20° east of Mont Alto.

Sample consisted of about 50 pieces taken from ore pile mined from pits to test quality.

Private analysis made by me for Mont Alto Iron Co., and published by permission of Mr. Geo. B. Wiestling, Superintendent.

(*39*) *Promise mine*, (Mont Alto Iron Co.,) three miles north, 20° east from Mont Alto.

Sample consisted of about 50 pieces taken from ore mined to test quality.

Worked open and underground 40′ deep.

Private analysis published by permission of Mr. Geo. B. Wiestling, Superintendent of Mont Alto Iron Works.

(*40*) *White Rock mine*, (Mont Alto Iron Co.,) two and one half miles north, 20° east from Mont Alto.

Sample consisted of about 50 pieces taken from several pits or shafts over an area of say 2,000′ square.

Private analysis published by permission of Mr. Geo. B. Wiestling.

(*41*) *Wiestling mine*, three miles north, 25° east of Mont Alto; or one and one half miles south of Greenwood.

Sample consisted of 99 pieces selected from ore taken out of several pits or shafts sunk to test quantity and quality.

*Franklin County.*

| | (42) *Wm. L. Chambers.* | (43) *Ahl's Pipe Ore.* |
|---|---|---|
| Sesquioxide of iron, | 75.714 | 78.785 |
| Sesquioxide of manganese, | .081 | .235 |
| Sesquioxide of cobalt, | .010 | .030 |
| Alumina, | 1.968 | .550 |
| Lime, | .350 | .730 |
| Magnesia, | .216 | .281 |
| Sulphuric acid, | .067 | .060 |
| Phosphoric acid, | .268 | .261 |
| Water and organic matter, | 11.760 | 11.222 |
| Silicious matter, | 8.770 | 7.780 |
| | 99.204 | 99.934 |
| Metallic iron, | 53.000 | 55.150 |
| Metallic manganese, | .057 | .165 |
| Sulphur, | .027 | .024 |
| Phosphorus, | .117 | .114 |
| Phosphorus in 100 parts iron, | .220 | .206 |

(42) *William L. Chambers' opening*, on farm about one mile north of Scotland.

Sample consisted of 75 pieces taken from surface ore near shaft.

(43) *Ahl's bank*, one and one half miles south west of Shippensburg, Southampton township. *Pipe ore.*

Sample consisted of 115 pieces taken from ore lying around and in opening. Bank not in operation.

*Franklin County.*

| | (44) *McHose.* | (45) *Joseph Cressler.* | (46) *Jacob Koser.* |
|---|---|---|---|
| Protoxide of iron, | trace. | trace. | trace. |
| Sesquioxide of iron, | 64.214 | 55.142 | 67.142 |
| Sesquioxide of manganese, | 1.728 | 1.002 | 1.809 |
| Sesquioxide of cobalt, | .050 | .070 | .090 |
| Alumina, | 2.100 | 1.625 | 1.471 |
| Lime, | .380 | .370 | .500 |
| Magnesia, | .396 | .138 | .183 |
| Sulphuric acid, | .100 | .072 | .075 |
| Phosphoric acid, | .316 | .407 | .678 |
| Water and organic matter, | 10.812 | 11.078 | 12.004 |
| Silicious matter, | 19.470 | 29.970 | 15.650 |
| | 99.566 | 99.874 | 99.602 |

| | | | |
|---|---|---|---|
| Metallic iron, | 44.950 | 38.600 | 47.000 |
| Metallic manganese, | 1.203 | .698 | 1.260 |
| Sulphur, | .040 | .029 | .030 |
| Phosphorus, | .138 | .178 | .296 |
| Phosphorus in 100 parts iron, | .307 | .461 | .629 |

(*44*) *McHose bank*, (Old "Neikirk" bank,) three miles west, south-west of Shippensburg. *Wash ore.*

Sample consisted of 227 pieces taken from pile of ore at washer.

(*45*) *Joseph Cressler bank*, about three miles south, south-west of Shippensburg, Southampton township. *Wash ore.*

Sample consisted of 878 pieces taken from pile of ore at washer.

(*46*) *Jacob Koser bank*, about three miles south, south-west of Shippensburg, Southampton township. *Wash ore.*

Sample consisted of 325 pieces taken from pile of ore at washer.

This is the same opening as the Joseph Cressler bank, but ore is mined from a higher level.

*Franklin County.*

| | (*47*) *Old Southampton.* | (*48*) *Ruby or Plaster.* | (*49*) *Gochenauer & Rohrer.* | (*50*) *Means.* |
|---|---|---|---|---|
| Sesquioxide of iron, | 65.071 | 53.142 | 62.500 | 69.214 |
| Sesquioxide of manganese, | 1.045 | 2.358 | 1.947 | 2.917 |
| Sesquioxide of cobalt, | .110 | .080 | .110 | .570 |
| Alumina, | 3.150 | 5.352 | 3.664 | 1.511 |
| Lime, | .280 | .580 | .790 | .480 |
| Magnesia, | .360 | .756 | .558 | .288 |
| Sulphuric acid, | .032 | .072 | .070 | .032 |
| Phosphoric acid, | 1.578 | 1.406 | 1.216 | .575 |
| Water and organic matter, | 11.660 | 11.468 | 12.360 | 11.838 |
| Silicious matter, | 16.460 | 24.250 | 16.680 | 13.270 |
| | 99.746 | 99.464 | 99.895 | 100.695 |
| Metallic iron, | 45.550 | 37.200 | 43.750 | 48.450 |
| Metallic manganese, | .728 | 1.642 | 1.356 | 2.031 |
| Sulphur, | .013 | .029 | .028 | .013 |
| Phosphorus, | .689 | .614 | .531 | .251 |
| Phosphorus in 100 parts iron, | 1.512 | 1.650 | 1.213 | .518 |

(*47*) *Old Southampton bank*, three miles south of Shippensburg, on old furnace property. Owned by George H. Stewart. Leased to Moses Taylor, New York.

Sample consisted of 213 pieces taken from ore lying around mine. Bank not in operation.

(*48*) *Ruby or Plaster bank*, three and one half miles south of Shippensburg, near old Southampton furnace.

Sample consisted of 275 pieces taken from ore lying around mine. Bank not in operation.

(*49*) *Gochenauer & Rohrer bank*, three miles south of Shippensburg, on Clever farm, near old Southampton furnace.

Sample consisted of 160 pieces taken from ore lying around mine. Bank not in operation at date of visit.

(*50*) *Means bank*, about three miles south east of Shippensburg, near county line.

Sample consisted of 121 pieces taken from ore dump. Bank not in operation.

*Cumberland County.*

| | (*51*) *John H. Cressler.* | (*52*) *Geo. Clever.* | (*53*) *No. 1 Clever.* | (*53a*) *"No. 1 Clever."* |
|---|---|---|---|---|
| Sesquioxide of iron, | 69.785 | 64.214 | 52.571 | 68.428 |
| Sesquioxide of manganese, | .351 | 1.417 | 8.054 | 8.599 |
| Sesquioxide of cobalt, | .420 | .040 | .230 | .280 |
| Alumina, | 1.971 | 2.350 | 1.777 | 1.953 |
| Lime, | .620 | .580 | 1.090 | .620 |
| Magnesia, | .410 | .504 | .374 | .129 |
| Sulphuric acid, | .067 | .062 | .047 | .037 |
| Phosphoric acid, | .334 | 1.225 | 4.092 | 1.518 |
| Water and organic matter, | 11.246 | 12.604 | 13.134 | 13.050 |
| Silicious matter, | 14.780 | 16.860 | 18.640 | 5.420 |
| | 99.984 | 99.856 | 100.009 | 100.034 |
| Metallic iron, | 48.850 | 44.950 | 36.800 | 47.900 |
| Metallic manganese, | .245 | .987 | 5.620 | 5.987 |
| Sulphur, | .027 | .025 | .019 | .015 |
| Phosphorus, | .146 | .535 | 1.787* | .663 |
| Phosphorus in 100 parts iron, | .298 | 1.190 | 4.856 | 1.384 |

(*51*) *John H. Cressler's bank*, (old "Clippinger,") two and one half miles south east of Shippensburg. *Wash ore.*

Sample consisted of 710 pieces taken from pile of ore at washer.

(*52*) *George Clever bank*, at Cleversburg. Worked by Wisegarver & Peacock. *Lump* and *wash* ore.

*A duplicate determination of the phosphorus, by Mr. John M. Stinson, gave 1.778 per cent.

Sample consisted of 315 pieces taken from ore pile at washer.

(*53*) *No. 1 Clever Mammoth bank*, (now Ahl's,) on Clever farm, one and one fourth miles south east of Cleversburg, Southampton townhip.

Sample consisted of 144 pieces taken from ore lying around and in mine at different places. Bank not in operation.

(*53a*) "*No. 1 Clever Mammoth bank*," one and one fourth miles south east of Cleversburg.

This sample was brought to the Laboratory by Mr. Daniel V. Ahl, and was said to have been selected by himself and miner from this bank.

| | *Cumberland County.* | | |
|---|---|---|---|
| | (*54*) | (*55*) | (*56*) |
| | | *Calico bank.* | |
| | *Bridge's.* | *Coover opening.* | *Rutherford opening.* |
| Protoxide of iron, | none. | trace. | trace. |
| Sesquioxide of iron, | 75.642 | 67.928 | 71.857 |
| Sesquioxide of manganese, | .382 | .133 | .133 |
| Sesquioxide of cobalt, | trace. | .060 | .060 |
| Alumina, | 1.250 | 2.205 | 2.356 |
| Lime, | .380 | .510 | .460 |
| Magnesia, | .331 | .403 | .457 |
| Sulphuric acid, | .097 | .115 | .102 |
| Phosphoric acid, | .300 | .197 | .197 |
| Water and organic matter, | 12.166 | 10.158 | 10.164 |
| Silicious matter, | 9.500 | 17.720 | 13.440 |
| | 100.048 | 99.429 | 99.226 |
| Metallic iron, | 52.950 | 47.550 | 50.300 |
| Metallic manganese, | .266 | .094 | .094 |
| Sulphur, | .039 | .046 | .041 |
| Phosphorus, | .131 | .086 | .086 |
| Phosphorus in 100 parts iron, | .247 | .180 | .170 |

(*54*) *John Bridge's opening*, two miles south-east of Shippensburg.

Sample consisted of 108 pieces selected from ore taken out of trial shaft; also from ore lying near same.

(*55*) *Calico bank—Coover opening*, (McCormick & Co.,) three miles north-east of Shippensburg. *Wash ore.*

Sample consisted of 524 pieces taken from ore pile at washer; also from pile at railroad wharf.

(*56*) *Calico bank—Rutherford opening*, (McCormick & Co.,) three miles north-east of Shippensburg. *Wash ore.*

Sample consisted of 351 pieces taken from ore lying around mine.

*Cumberland County.*

| | (*57*) *Chestnut.* | (*58*) *Geo. H. Clever.* | (*59*) *Big Pond.* |
|---|---|---|---|
| Sesquioxide of iron, | 58.000 | 72.314 | 62.857 |
| Sesquioxide of manganese, | 1.212 | 3.032 | 1.831 |
| Sesquioxide of cobalt, | .070 | .270 | .200 |
| Alumina, | 2.250 | 2.100 | 1.853 |
| Lime, | .630 | .540 | .660 |
| Magnesia, | .306 | .302 | .270 |
| Sulphuric acid, | .057 | .067 | .075 |
| Phosphoric acid, | .705 | 1.266 | .728 |
| Water and organic matter, | 10.778 | 13.013 | 10.896 |
| Silicious matter, | 25.350 | 7.750 | 20.520 |
| | 99.358 | 100.654 | 99.890 |
| Metallic iron, | 40.600 | 50.620 | 44.000 |
| Metallic manganese, | .844 | 2.111 | 1.275 |
| Sulphur, | .023 | .027 | .030 |
| Phosphorus, | .308 | .553 | .318 |
| Phosphorus in 100 parts iron, | .758 | 1.090 | .722 |

(*57*) *Chestnut bank*, (McCormick & Co. and Lawton & Stewart,) four miles east of Shippensburg. *Wash ore.*

Sample consisted of 953 pieces taken from ore pile at washer. Mine not in operation.

(*58*) *George H. Clever bank*, one and a half miles east of Cleversburg, Southampton township. *Lump* and *wash* ore.

Sample consisted of 356 pieces taken from pile of ore prepared for shipment.

(*59*) *Big Pond bank*, (Philadelphia and Reading Coal and Iron Co.,) about five miles east of Shippensburg, or about one half mile west of Big Pond furnace.

Sample consisted of 175 pieces taken from ore found in place and lying around the three most westerly openings. Bank not in operation.

*Cumberland County.*

| | (*60*) *Old Peach Orchard.* | (*61*) *Peffer.* |
|---|---|---|
| Sesquioxide of iron, | 64.214 | 77.428 |
| Sesquioxide of manganese, | 2.431 | .123 |
| Sesquioxide of cobalt, | .110 | .140 |
| Alumina, | 2.230 | 1.502 |

2 M³.

| | | |
|---|---|---|
| Lime, | .580 | .740 |
| Magnesia, | .342 | .443 |
| Sulphuric acid, | .020 | .112 |
| Phosphoric acid, | 1.708 | .471 |
| Water and organic matter, | 11.756 | 12.266 |
| Silicious matter, | 15.950 | 6.560 |
| | 99.341 | 99.785 |
| Metallic iron, | 44.950 | 54.200 |
| Metallic manganese, | 1.693 | .086 |
| Sulphur, | .008 | .045 |
| Phosphorus, | .746 | .206 |
| Phosphorus in 100 parts iron, | 1.659 | .308 |

(*60*) *Old Peach Orchard bank*, (Grove & Co.,) about three miles south west of Centerville, or about three miles south east of Jacksonville.

Sample consisted of 121 pieces taken from ore in place, also from wash ore lying around mine. Bank not in operation.

(*61*) *Peffer bank*, two miles west of Papertown.

Sample consisted of 152 pieces taken from ore lying around mine. Bank not in operation.

*Cumberland County.*

| | (*62*) | (*63*) | (*64*) | (*65*) |
|---|---|---|---|---|
| | *South Mountain Mining & Iron Co.* | | | |
| | *Wild Cat.* | *Pine Grove.* | *Laurel No. 2.* | *Laurel No. 1.* |
| Sesquioxide of iron, | 68.857 | 60.212 | 58.000 | 54.428 |
| Sesquioxide of manganese, | .527 | 3.891 | 4.408 | 10.379 |
| Sesquioxide of cobalt, | .240 | .130 | .340 | .520 |
| Alumina, | 1.684 | 1.559 | 4.296 | 1.565 |
| Lime, | .610 | .950 | .500 | .890 |
| Magnesia, | .328 | .771 | .627 | .418 |
| Sulphuric acid, | .062 | .070 | .085 | .056 |
| Phosphoric acid, | 3.119 | .629 | 1.124 | .387 |
| Water and organic matter, | 11.287 | 11.176 | 11.622 | 11.373 |
| Silicious matter, | 12.800 | 20.900 | 19.260 | 20.220 |
| | 99.514 | 100.288 | 100.262 | 100.236 |
| Metallic iron, | 48.200 | 42.150 | 40.600 | 38.100 |
| Metallic manganese, | .367 | 2.709 | 3.069 | 7.226 |
| Sulphur, | .025 | .028 | .034 | .022 |
| Phosphorus, | 1.365 | .275 | .491 | .169 |
| Phosphorus in 100 parts iron, | 2.831 | .652 | 1.209 | .443 |

(*62*) *Wild Cat openings*, (South Mountain Mining and Iron Co.,) about two and one half miles south west of Pine Grove.

Sample consisted of 60 pieces selected from ore taken out of several openings or shafts.

(*63*) *Pine Grove ore bank*, (South Mountain Mining and Iron Co..) at Pine Grove furnace.

Sample consisted of 154 pieces taken from ore in place at different parts of bank. Ore mined for use at Pine Grove furnace.

(*64*) *Laurel No. 2 bank*, (South Mountain Mining and Iron Co.,) about one mile south of Laurel forge.

Sample consisted of 160 pieces taken from ore pile at bank. Bank not in operation at date of visit.

(*65*) *Laurel No. 1 bank*, (South Mountain Mining and Iron Co.,) at Laurel forge.

Sample consisted of 112 pieces taken from ore lying in and around mine. Bank not in operation. Samples selected independently by Mr. Daniel King, superintendent Pine Grove furnace, and analyzed by him corroborated the above results.

*Cumberland County.*

| | (*66*) Henry Clay No. 3. | (*67*) Henry Clay No. 2. | (*68*) Henry Clay | (*68a*) Clay No. 1. |
|---|---|---|---|---|
| Sequioxide of iron, | 59.071 | 52.643 | 51.214 | 71.785 |
| Sesquioxide of manganese, | 1.799 | 2.173 | 3.227 | .103 |
| Sesquioxide of cobalt, | .240 | .280 | .210 | .070 |
| Alumina, | 2.365 | 2.324 | 1.885 | 3.630 |
| Lime, | .590 | .460 | .590 | .260 |
| Magnesia, | .504 | .468 | .468 | .194 |
| Sulphuric acid, | .060 | .060 | .080 | .017 |
| Phosphoric acid, | 1.525 | .733 | .421 | 1.175 |
| Water and organic matter, | 11.332 | 10.420 | 9.678 | 11.644 |
| Silicious matter | 22.000 | 29.970 | 31.890 | 10.650 |
| | 99.486 | 99.531 | 99.663 | 99.528 |
| Metallic iron, | 41.350 | 36.850 | 35.850 | 50.250 |
| Metallic manganese, | 1.253 | 1.513 | 2.247 | .072 |
| Sulphur, | .024 | .024 | .032 | .007 |
| Phosphorus, | .666 | .320 | .184 | .513 |
| Phosphorus in 100 parts iron, | 1.610 | .868 | .513 | 1.020 |

(*66*) *Henry Clay No. 3 bank*, (Seyfert & McManus) two and a half miles north east of Laurel.

Sample consisted of 70 pieces taken from ore lying around mine. Bank not in operation.

(*67*) *Henry Clay No. 2 bank*, (Lanigan & Wynkoop) about two and three fourth miles north east of Laurel. Henry M. Watts & Son, lessees.

Sample consisted of 101 pieces taken from ore in place and also from that lying around mine. Bank not in operation at date of sampling.

(*68*) *Henry Clay No. 1 bank*, (Guiterman & Robinson) three miles north east of Laurel. Mount Holly Ore Bank Company, lessees.

Sample consisted of 90 pieces taken from ore lying around mine. Bank not in operation at date of sampling.

(*68a*) *Henry Clay No. 1 bank*, (Guiterman & Robinson) three miles north east of Laurel. Mount Holly Ore Bank Company, lessees.

Samples of *lump ore* selected by Mr. Ethelbert Watts since bank has been operated.

*Cumberland County.*

| | (*69*) *Diven tract.* | (*70*) *Koontz & Myers.* |
|---|---|---|
| Sesquioxide of iron, | 64.500 | 49.285 |
| Sesquioxide of manganese, | .507 | .650 |
| Sesquioxide of cobalt, | .230 | .040 |
| Alumina, | 3.868 | 5.867 |
| Lime, | .630 | .600 |
| Magnesia, | .630 | .972 |
| Sulphuric acid, | .035 | .102 |
| Phosphoric acid, | 1.772 | .538 |
| Water and organic matter, | 12.127 | 10.385 |
| Silicious matter, | 14.970 | 30.840 |
| | 99.269 | 99.279 |
| Metallic iron, | 45.150 | 34.500 |
| Metallic manganese, | .353 | .453 |
| Sulphur, | .014 | .041 |
| Phosphorus, | .774 | .235 |
| Phosphorus in 100 parts iron, | 1.714 | .681 |

(*69*) *Diven tract openings*, (McCormick & Co.) three and one half miles north east of Laurel.

Sample consisted of 106 pieces taken from ore found at 11 different pits or trial shafts.

(*70*) *Koontz & Myers' bank*, about three and one half miles north east of Laurel. *Wash ore.*

Sample consisted of 174 pieces selected from ore pile.

Ore from which sample was taken was prepared by the so-called "Dry Washer," so that analysis practically represents the ore unwashed.

*Cumberland County.*

| | (71) *Grove Wash ore.* | (71a) *Grove Lump ore.* | (72) *J. C. Lehman, No. 2.* |
|---|---|---|---|
| Sesquioxide of iron, | 51.571 | 67.000 | 62.785 |
| Sesquioxide of manganese, | 2.266 | 1.841 | .178 |
| Sesquioxide of cobalt, | .260 | .170 | .070 |
| Alumina, | 2.964 | 3.910 | 3.546 |
| Lime, | .580 | .210 | .380 |
| Magnesia, | .385 | .183 | .321 |
| Sulphuric acid, | .037 | .007 | .115 |
| Phosphoric acid, | 2.095 | 1.852 | .199 |
| Water and organic matter, | 11.204 | 10.870 | 12.874 |
| Silicious matter, | 28.620 | 13.370 | 18.860 |
| | 99.982 | 99.413 | 99.328 |
| Metallic iron, | 36.100 | 46.900 | 43.950 |
| Metallic manganese, | 1.578 | 1.282 | .124 |
| Sulphur, | .015 | .003 | .046 |
| Phosphorus, | .915 | .809 | .087 |
| Phosphorus in 100 parts of iron, | 2.534 | 1.725 | .197 |

(*71*) *Grove bank*, about one half mile south of Hunter's Run Station, South Mountain railroad. *Wash ore.* Bank adjoins the Lehman No. 2 tract.

Sample consisted of 410 pieces taken from ore pile at washer.

(*71a*) *Grove bank*, about one half mile south of Hunter's Run Station. *Lump ore.*

Sample of the lump ore selected by Dr. E. A. Grove at my request.

(*72*) *J. C. Lehman No. 2 bank*, (Eisenhower & Gill,) about three quarters of a mile south of Hunter's Run Station, South Mountain railroad: *Wash ore.*

Sample consisted of 192 pieces taken from pile of ore prepared for shipment.

This bank has been quite recently leased by Messrs. Henry M. Watts & Son.

*Cumberland County.*

| | (73) *Mount Holly (Medlar.)* | (73a) *Mount Holly (Medlar.)* |
|---|---|---|
| Sesquioxide of iron, | 54.643 | 69.285 |
| Sesquioxide of manganese, | 3.921 | 1.044 |
| Sesquioxide of cobalt, | .360 | .230 |
| Alumina, | 2.010 | 1.141 |
| Lime, | .150 | .670 |
| Magnesia, | .304 | .145 |
| Sulphuric acid, | .012 | .015 |
| Phosphoric acid, | 3.144 | 3.708 |
| Water and organic matter, | 11.312 | 12.298 |
| Silicious matter, | 23.550 | 11.270 |
| | 99.406 | 99.806 |
| Metallic iron, | 38.250 | 48.500 |
| Metallic manganese, | 2.730 | .727 |
| Sulphur, | .005 | .006 |
| Phosphorus, | 1.373 | 1.619 |
| Phosphorus in 100 parts iron, | 3.589 | 3.338 |

(*73*) *Mount Holly* (*Medlar*) *bank*, (Mount Holly Ore Bank Company,) about one mile south west of Mount Holly. *Two thirds lump and one third wash ore.*

Sample consisted of 230 pieces taken from ore in place at different parts of bank; wash ore from ore pile.

(*73a*) *Mount Holly* (*Medlar*) *bank*, (Mount Holly Ore Bank Company,) about one mile south west of Mount Holly.

Sample represents the dark brown cellular lump ore from north east end of bank, analysed separately.

*Cumberland County.*

| | (74) *Mullen.* | (75) *Strickler.* | (76) *Pepper.* |
|---|---|---|---|
| Sesquioxide of iron, | 64.142 | 61.357 | 64.428 |
| Sesquioxide of manganese, | 2.638 | .133 | .330 |
| Sesquioxide of cobalt, | .180 | .260 | .290 |
| Alumina, | 1.130 | 2.555 | 1.749 |
| Lime, | 2.010 | .530 | .590 |
| Magnesia, | .418 | .562 | .299 |
| Sulphuric acid, | .056 | .067 | .050 |
| Phosphoric acid, | .898 | 3.188 | .403 |
| Water and organic matter, | 12.035 | 11.668 | 11.200 |
| Silicious matter, | 16.180 | 18.960 | 21.020 |
| | 99.687 | 99.280 | 100.359 |
| Metallic iron, | 44.900 | 42.950 | 45.100 |
| Metallic manganese, | 1.837 | .093 | .230 |
| Sulphur, | .022 | .027 | .020 |
| Phosphorus, | .392 | 1.392 | .176 |
| Phosphorus in 100 parts iron, | .873 | 3.240 | .390 |

(74) *Mullen bank*, about one mile west of Mount Holly. *One fourth lump and three fourths wash ore.* Mr. Daniel King, lessee.

Sample consisted of 640 pieces taken from pile of ore prepared for shipment.

(75) *Strickler bank*, one mile east of Mount Holly, or three miles south-west of Boiling Springs.

Sample consisted of 130 pieces taken from ore in place, also from ore lying around mine. Bank not in operation.

(76) *Pepper bank*, ("Old mine,") two miles south west of Boiling Springs.

Sample consisted of 123 pieces taken from ore lying around mine. Bank not in operation.

*Cumberland County.*

| | (77) *Ege bank.* | (77a) *Ege bank.* | (78) *Beltzhoover bank.* | (78a) *Beltzhoover bank.* |
|---|---|---|---|---|
| | *Lump ore.* | *Wash ore.* | *Lump ore.* | *Wash ore.* |
| Sesquioxide of iron, | 49.071 | 45.928 | 58.428 | 52.785 |
| Sesquioxide of manganese, | 6.519 | 4.469 | 3.725 | 1.934 |
| Sesquioxide of cobalt, | .180 | .170 | .130 | .120 |
| Alumina, | 2.368 | 4.677 | 2.861 | 4.980 |
| Lime, | .500 | .500 | .500 | .610 |
| Magnesia, | .342 | .637 | .504 | .753 |
| Sulphuric acid, | .055 | .055 | .075 | .072 |
| Phosphoric acid, | 2.471 | 2.425 | 2.081 | 1.695 |
| Water and organic matter, | 11.674 | 11.814 | 12.186 | 12.240 |
| Silicious matter, | 26.370 | 28.800 | 19.290 | 24.360 |
| | 99.550 | 99.475 | 99.780 | 99.549 |
| Metallic iron, | 34.350 | 32.150 | 40.900 | 36.950 |
| Metallic manganese, | 4.539 | 3.112 | 2.594 | 1.347 |
| Sulphur, | .022 | .022 | .030 | .029 |
| Phosphorus, | 1.079 | 1.059 | .909 | .740 |
| Phosphorus in 100 parts iron, | 3.141 | 3.293 | 2.222 | 2.003 |

(77) *Ege bank*, (Philadelphia and Reading Coal and Iron Co.,) one mile south east of Boiling Springs. *Lump ore.*

Sample consisted of 177 pieces taken from ore pile at mine.

(77a) *Ege bank*, (Philadelphia and Reading Coal and Iron Co.,) one mile south east of Boiling Springs. *Wash ore.*

Sample consisted of 345 pieces taken from ore pile at mine.

(78) *Beltzhoover bank*, (Philadelphia and Reading Coal and Iron Co.,) two miles south east of Boiling Springs. *Lump ore.*

Sample consisted of 195 pieces taken from ore pile at mine.

(*78a*) *Beltzhoover bank*, (Philadelphia and Reading Coal and Iron Co.,) two miles south east of Boiling Springs. *Wash ore.*

Sample consisted of 320 pieces taken from ore pile at mine.

*Cumberland County.*

| | (*79*) *Leidig & Hoffer.* |
|---|---|
| Sesquioxide of iron, | 69.571 |
| Sesquioxide of manganese, | .352 |
| Sesquioxide of cobalt, | .040 |
| Alumina, | 1.560 |
| Lime, | .350 |
| Magnesia, | .248 |
| Sulphuric acid, | .062 |
| Phosphoric acid, | .870 |
| Water and organic matter, | 11.796 |
| Silicious matter, | 15.090 |
| | 99.939 |
| Metallic iron, | 48.700 |
| Metallic manganese, | .245 |
| Sulphur, | .025 |
| Phosphorus, | .380 |
| Phosphorus in 100 parts iron, | .780 |

(*79*) *Leidig & Hoffer bank*, about three and one half miles south east of Boiling Springs.

Sample consisted of 186 pieces selected from ore lying around mine. Bank not in operation.

*York County.*

| | (*80*) *Wolf.* | (*81*) *Heck.* | (*82*) *Coover & Wolf.* |
|---|---|---|---|
| Sesquioxide of iron, | 58.500 | 63.571 | 65.000 |
| Sesquioxide of manganese, | .713 | .443 | 1.873 |
| Sesquioxide of cobalt, | .140 | .090 | .190 |
| Alumina, | 3.872 | 2.138 | 2 050 |
| Lime, | .700 | .350 | .140 |
| Magnesia, | .641 | .288 | .396 |
| Sulphuric acid, | .082 | .062 | .057 |
| Phosphoric acid, | 1.628 | .661 | .783 |
| Water and organic matter, | 11.926 | 11.132 | 12.200 |
| Silicious matter, | 21.100 | 20.850 | 16.570 |
| | 99.302 | 99.585 | 99.259 |

| | | | |
|---|---|---|---|
| Metallic iron, | 40.950 | 44.500 | 45.500 |
| Metallic manganese, | .497 | .309 | 1.304 |
| Sulphur, | .032 | .025 | .023 |
| Phosphorus, | .711 | .289 | .342 |
| Phosphorus in 100 parts iron, | 1.736 | .649 | .751 |

(*80*) *Wolf bank*, three miles west, south west of Dillsburg.

Sample consisted of 273 pieces taken from ore in place at different parts of mine; also from ore pile at washer.

Bank not in operation.

(*81*) *Heck bank*, (old "Knaub" bank,) three miles west of Dillsburg. *Lump* and *wash* ore.

Sample consisted of 580 pieces taken from ore in place at different parts of mine. Wash ore taken from ore pile at washer.

(*82*) *Coover & Wolf bank*, two and one half miles west of Dillsburg. *Lump ore.*

Sample consisted of 156 pieces taken from ore pile at mine.

*York County.*

| | (*83*) *C. H. Bender* | (*84*) *McCormick & Co.* |
|---|---|---|
| Sesquioxide of iron, | 64.357 | 62 857 |
| Sesquioxide of manganese, | .589 | 1.811 |
| Sesquioxide of cobalt, | .170 | .210 |
| Alumina, | 3.123 | 3.955 |
| Lime, | .510 | .630 |
| Magnesia, | .342 | .299 |
| Sulphuric acid, | .042 | .060 |
| Phosphoric acid, | 1.170 | 2.178 |
| Water and organic matter, | 12.068 | 12.596 |
| Silicious matter, | 17.240 | 14.820 |
| | 99.611 | 99.416 |
| Metallic iron, | 45.050 | 44.000 |
| Metallic manganese, | .410 | 1.261 |
| Sulphur, | .017 | .024 |
| Phosphorus, | .511 | .951 |
| Phosphorus in 100 parts iron, | 1.134 | 2.161 |

(*83*) *C. H. Bender bank*, two miles south west of Dillsburg.

Sample consisted of 206 pieces taken from ore in place; also from that lying around mine. Bank not in operation.

(*84*) *McCormick & Co.'s bank*, (Attick's) two miles south west of Dillsburg.

Sample consisted of 235 pieces taken from ore in place; also from that lying around opening. Bank not in operation.

These two banks adjoin each other.

*Dillsburg Magnetites.*

*York County.*

| | (*85*) *Shelly & Hoffer.* | (*86*) *Bell.* | (*87*) *McClure.* |
|---|---|---|---|
| Bisulphide of iron, | .062 | 2.604 | 1.605 |
| Protoxide of iron | 6.942 | 15.171 | 13.821 |
| Sesquioxide of iron, | 45.923 | 42.193 | 47.859 |
| Protoxide of manganese, | .155 | .139 | .036 |
| Protoxide of cobalt, | .330 | .080 | .040 |
| Oxide of copper, | .003 | none. | trace. |
| Alumina, | 2.560 | 3.102 | 3.775 |
| Lime, | 10.290 | 9.200 | 5.604 |
| Magnesia, | 5.200 | 5.333 | 4.129 |
| Sulphuric acid, | .099 | .900 | 1.105 |
| Phosphoric acid, | .052 | .043 | .107 |
| Carbonic acid, | none. | .428 | none. |
| Water, | 3.106 | 1.050 | 1.140 |
| Silica, | 25.370 | 19.640 | 20.330 |
| | 100.092 | 99.883 | 99.551 |
| Metallic iron, | 37.575 | 42.550 | 45.000 |
| Metallic manganese, | .120 | .108 | .028 |
| Sulphur, | .072 | 1.750 | 1.297 |
| Phosphorus, | .023 | .019 | .047 |
| Phosphorus in 100 parts iron, | .061 | .044 | .104 |

(*85*) *Shelly & Hoffer mine*, one and a half miles south east of Dillsburg.

Sample consisted of about 15 lbs. of the ore selected from different parts of ore pile.

(*86*) *Bell mine*, two miles south east of Dillsburg.

Sample consisted of about 15 lbs. of the ore selected from different parts of ore pile *Pyrites considerably decomposed.*

(*87*) *McClure mine*, (King & Jauss) two miles east of Dillsburg.

Sample consisted of about 25 lbs. of the ore taken at 30 feet from outcrop.

A sample selected by Mr. King at 110 feet from outcrop gave: Metallic iron, 43.000; sulphur, 1.230; phosphorus, .028; silica, 17.780; phosphorus in 100 parts iron, .065. This second sample carried considerable lime as carbonate.

*York County.*

| | (88) *Longnecker old mine.* | (89) *Longnecker new mine.* | (90) *Underwood.* |
|---|---|---|---|
| Bisulphide of iron, | .819 | .013 | 3.047 |
| Protoxide of iron, | 11.957 | 15.300 | 15.685 |
| Sesquioxide of iron, | 40.954 | 44.420 | 37.968 |
| Protoxide of manganese, | .102 | .102 | .093 |
| Protoxide of cobalt, | .176 | .100 | .116 |
| Oxide of copper, | .014 | trace. | .014 |
| Alumina, | 4.898 | 5.006 | 4.150 |
| Lime, | 9.600 | 8.610 | 9.970 |
| Magnesia, | 6.462 | 5.657 | 6.614 |
| Sulphuric acid, | .532 | .020 | .765 |
| Phosphoric acid, | .037 | .066 | .068 |
| Carbonic acid, | .220 | .418 | .418 |
| Water, | 1.985 | 1.066 | 1.400 |
| Silica, | 21.830 | 18.770 | 19.030 |
| | 99.586 | 99.548 | 99.338 |
| Metallic iron, | 38.350 | 43.000 | 40.200 |
| Metallic manganese, | .079 | .079 | .072 |
| Sulphur, | .650 | .015 | 1.931 |
| Phosphorus, | .016 | .029 | .030 |
| Phosphorus in 100 parts iron, | .041 | .067 | .074 |

(88) *Longnecker old mine*, one mile east of Dillsburg, on Underwood property.

Sample consisted of about 15 pounds of the ore selected from different parts of ore pile.

(89) *Longnecker new mine*, one mile east of Dillsburg, and 300 feet north east of old mine.

Sample consisted of about 15 pounds of the ore selected from different parts of ore pile at mine.

(90) *Underwood mine*, one mile east of Dillsburg.

Sample consisted of about 15 pounds of the ore selected from different parts of ore pile. Pyrites considerably decomposed.

*York County.*

| | (91) *Mumper.* | (92) *Logan.* |
|---|---|---|
| Bisulphide of iron, | none. | 4.093 |
| Protoxide of iron, | 9.643 | 18.643 |
| Sesquioxide of iron, | 43.714 | 42.100 |
| Protoxide of manganese, | .129 | .186 |
| Sulphide of cobalt, | trace. | .766 |
| Sulphide of copper, | trace. | .098 |
| Alumina, | 3.650 | 2.417 |
| Lime, | 11.020 | 6.132 |
| Magnesia, | 5.030 | 6.738 |
| Potash and soda, | — | .350 |
| Sulphuric acid, | .017 | .119 |
| Phosphoric acid, | .055 | .052 |
| Carbonic acid, | .846 | 1.760 |
| Water, | 2.490 | 1.080 |
| Silica, | 22.900 | 15.120 |
| | 99.494 | 99.654 |
| Metallic iron, | 38.100 | 45.880 |
| Metallic manganese, | .100 | .144 |
| Sulphur, | .007 | 2.680 |
| Phosphorus, | .024 | .023 |
| Phosphorus in 100 parts iron, | .063 | .050 |

(*91*) *Mumper mine*, (McCormick & Co.,) one mile north east of Dillsburg.

Sample about 25 pounds taken from ore in drift by Mr. Thomas Parfet.

(*92*) *Logan mine*, (McCormick & Co.,) one mile north east of Dillsburg.

Sample about 50 pounds selected by Prof. Frazer.

*York County.*

| | (93) *Landis or Fuller mine.* | (93a) |
|---|---|---|
| | *Lower level.* | *Upper level.* |
| Bisulphide of iron, | .450 | .013 |
| Protoxide of iron, | 18.385 | 17.614 |
| Sesquioxide of iron, | 43.414 | 49.487 |
| Protoxide of manganese, | .352 | .157 |
| Protoxide of cobalt, | .326 | .050 |
| Oxide of copper, | trace. | trace. |
| Alumina, | 2.774 | 2.098 |
| Lime, | 7.563 | 5.820 |
| Magnesia, | 5.001 | 4.969 |
| Potash and soda, | .054 | — |
| Sulphuric acid, | .011 | .007 |

| | | |
|---|---|---|
| Phosphoric acid, | .052 | .041 |
| Carbonic acid, | 1.640 | .354 |
| Water, | 2.320 | 2.430 |
| Silica, | 17.860 | 16.640 |
| | 100.202 | 99.680 |
| Metallic iron, | 44.900 | 48.350 |
| Metallic manganese, | .272 | .122 |
| Sulphur, | .244 | .007 |
| Phosphorus, | .023 | .018 |
| Phosphorus in 100 parts iron, | .051 | .037 |

(*93*) *Landis or Fuller mine*, on Yellow Breeches creek, three miles north east of Dillsburg. *Lower level.* J. C. Fuller, Joseph Fuller and Daniel King, lessees.

Sample consisted of about 50 pounds of ore selected by Prof. Frazer. Ore taken at depth of 60 feet from surface.

(*93a*) *Landis or Fuller mine*, on Yellow Breeches creek, three miles north east of Dillsburg. *Upper level.*

Sample consisted of about 15 pounds of ore taken from ore pile at different places. Ore taken from workings at depth of 40 feet from surface.

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## *Perry County.*

The iron ores of Perry county occur chiefly in formations No. V and No. VIII. *The Clinton fossil ores of No. V* have already been described in Report MM, pp. 234 and 235, and in greater detail in Report F, so that no further reference to them is here necessary. The *fossil ores of VIII* may be the same as the Mansfield ores of Tioga county, but their identification with them has not yet been sufficiently established. The specimens examined from Perry county are generally very shaly and their contents of metallic iron low. Most of the brown hematite ores of Perry county are mined from the *Marcellus ore bed* which underlies the black slates of No. VIII, and overlies the green calcareous shales. Although the thickness of the ore deposit is extremely variable yet a large quantity of ore has been mined at different localities from this horizon. The quality is usually quite good, the ore being almost uniformly low in its contents of

phosphorus. A small quantity of ore has also been mined in the *Corniferous shales;* but the quality of the ore is usually inferior, although occasional deposits are met with which are quite rich in iron.

*Perry County.*
*Brown Hematites.*

| | (94) Loy. | (95) Long. |
|---|---|---|
| Sesquioxide of iron, | 71.071 | 56.928 |
| Sesquioxide of manganese, | .694 | .313 |
| Alumina, | 2.907 | 4.477* |
| Lime, | .330 | .510 |
| Magnesia, | .277 | .464 |
| Sulphuric acid, | .090 | .335 |
| Phosphoric acid, | .242 | .263 |
| Water and organic matter, | 12.770 | 12.100 |
| Silicious matter, | 11.620 | 24 610 |
| | 100.001 | 100.000 |
| Metallic iron, | 49.750 | 39.850 |
| Metallic manganese, | .483 | .218 |
| Sulphur, | .036 | .134 |
| Phosphorus, | .106 | .115 |
| Phosphorus in 100 parts iron, | .213 | .288 |

(*94*) *Mr. Loy's land*, two miles northeast of Landisburg, on the southeast side of Loy's Hill. Surface ore. *Marcellus brown hematite.*

Cellular; brittle; dark-brown and yellowish-brown.

(*95*) *D. J. Long's land*, three miles southwest of New Bloomfield, on northwest side of Mahonoy Ridge. *Marcellus brown hematite.*

Generally cellular and brittle; light-brown and yellowish-brown.

*Perry County.*

| | (96) Mahonoy Ridge. |
|---|---|
| Iron, | 42.650 |
| Sulphur, | .046 |
| Phosphorus, | .142 |
| Silicious matter, | 22.580 |
| Phosphorus in 100 parts iron, | .332 |

(*96*) *On north west side of Mahonoy Ridge*, three miles south west of New Bloomfield. *Marcellus brown hematite.*

Rather hard and brittle; compact, somewhat shaly; carries considerable adhering red clay. Dark brown generally. (J. M. S.)

*By difference.

*Perry County—Carbonate Ore.*

| | (97) *D. J. Long.* |
|---|---|
| Bisulphide of iron, | 1.117 |
| Protoxide of iron, | 21.471 |
| Sesquioxide of iron, | 19.571 |
| Sesquioxide of manganese, | 1.448 |
| Sesquioxide of cobalt, | trace. |
| Alumina, | 1.352 |
| Lime, | 2.230 |
| Magnesia, | .872 |
| Sulphuric acid, | .107 |
| Phosphoric acid, | .091 |
| Carbonic acid, | 14.871 |
| Water, | 4.430 |
| Silicious matter, | 32.440 |
| | 100.000 |
| Metallic iron, | 30.920 |
| Metallic manganese, | 1.008 |
| Sulphur, | .639 |
| Phosphorus, | .040 |
| Phosphorus in 100 parts iron, | .129 |

(97) *D. J. Long's land*, three miles south west of New Bloomfield on north west side of Mahonoy Ridge. *Marcellus carbonate ore.*

More or less oxidized throughout; comparatively soft, with sandy appearance. Color, dark brown.

*Perry County.*

| | (98) *MacNamara.* | (99) *Barnitz.* |
|---|---|---|
| Sesquioxide of iron, | 56.857 | 67.428 |
| Sesquioxide of manganese, | .192 | .705 |
| Alumina, (by difference,) | 4.470 | 3.475 |
| Lime, | .540 | .510 |
| Magnesia, | .583 | .335 |
| Sulphuric acid, | .067 | .105 |
| Phosphoric acid, | 1.291 | .432 |
| Water and organic matter, | 10.130 | 13.740 |
| Silicious matter, | 25.870 | 13.270 |
| | 100.000 | 100.000 |
| Metallic iron, | 39.800 | 47.250 |
| Metallic manganese, | .134 | .490 |
| Sulphur, | .027 | .042 |
| Phosphorus, | .564 | .189 |
| Phosphorus in 100 parts iron, | 1.417 | .400 |

(98) *Mr. MacNamara's land*, two miles south east from New Bloomfield. *Corniferous brown hematite.*

Generally compact and brittle; dark brown and reddish brown.

(*99*) *Barnitz farm*, near New Bloomfield. *Marcellus brown hematite.*

Bombshell ore; fine grained; brittle; dark brown. Carries considerable carbonaceous matter.

*Perry County.*

| | (*100*) | (*101*) | (*102*) |
|---|---|---|---|
| | "*Washer Ore Pit.*" | | |
| Sesquioxide of iron, | 50.285 | 61.143 | 62.000 |
| Sesquioxide of manganese, | .051 | .072 | .072 |
| Alumina, | 5.101* | 2.937 | 4.191 |
| Lime, | 1.070 | .650 | .600 |
| Magnesia, | .342 | .288 | .324 |
| Sulphuric acid, | trace. | .107 | .135 |
| Phosphoric acid, | .146 | .176 | .279 |
| Water and organic matter, | 7.465 | 9.980 | 9.925 |
| Silicious matter, | 35.540 | 24.640 | 22.570 |
| | 100.000 | 99.993 | 100.096 |
| Metallic iron, | 35.200 | 42.800 | 43.400 |
| Metallic manganese, | .035 | .050 | .050 |
| Sulphur, | trace. | .043 | .054 |
| Phosphorus, | .064 | .077 | .122 |
| Phosphorus in 100 parts iron, | .181 | .179 | .281 |

(*100*) "*Washer ore pit*," about two miles south west from Newport, on Limestone Ridge. From the clay in the ore pit near the surface. *Corniferous brown hematite.*

Generally compact and fine grained; appearance shaly; color, reddish brown.

(*101*) "*Washer ore pit*," about two miles south west from Newport, on crest of Limestone Ridge, at Newport and Duncannon road. In synclinal of Oriskany sandstone, in the upper part of the Corniferous shale. *Corniferous brown hematite.*

Compact and fine grained; dark brown and reddish brown; some of the ore has a shaly appearance.

(*102*) "*Washer ore pit*," about two miles south west from Newport, on crest of Limestone Ridge. *Corniferous brown hematite.*

Appearance sandy; very brittle; dark brown and yellowish brown.

* By difference.

*Perry County.*

| | (*103*) | (*104*) |
|---|---|---|
| | *Limestone Ridge Mining Company.* | |
| Sesquioxide of iron, | 59.500 | 54.214 |
| Sesquioxide of manganese, | .120 | .083 |
| Alumina, | 5.072* | 2.044 |
| Lime, | .720 | .600 |
| Magnesia, | .324 | .327 |
| Sulphuric acid, | .100 | .047 |
| Phosphoric acid, | .469 | 2.072 |
| Water and organic matter, | 10.495 | 8.065 |
| Silicious matter, | 23.200 | 31.870 |
| | 100.000 | 99.322 |
| Metallic iron, | 41.650 | 37.950 |
| Metallic manganese, | .083 | .058 |
| Sulphuric, | .040 | .019 |
| Phosphorus, | .205 | .905 |
| Phosphorus in 100 parts iron, | .492 | 2.384 |

(*103*) *Limestone Ridge Mining Co.*, two miles from Newport, on Limestone Ridge; east end of long ore pit, east of "Washer ore pit." *Corniferous brown hematite.*

Bombshell ore, with considerable clay in bomb; very brittle; color, dark brown.

(*104*) *Limestone Ridge Mining Co.* From first opening north east of east ore pit; on crest of Limestone Ridge, south of Newport; on the road leading off from the Newport and Bailey Station road. In the synclinal of the Oriskany sandstone. A few hundred tons mined by the Limestone Ridge Mining Co. *Corniferous brown hematite.*

Generally compact and fine-grained; somewhat shaly; dark brown.

*Perry County.*

| | (*105*) *Long.* | (*106*) *Schuyler.* | (*107*) *Smith.* | (*108*) *Rinesmith.* |
|---|---|---|---|---|
| Sesquioxide of iron, | 38.714 | 72.857 | 33.643 | 60.928 |
| Sesquioxide of manganese, | .517 | .485 | .020 | .100 |
| Alumina, | 5.974 | .777 | 4.023* | 3.746* |
| Lime, | .570 | .690 | .960 | .660 |
| Magnesia, | .292 | .187 | .767 | .216 |
| Sulphuric acid, | .027 | .077 | trace. | .155 |
| Phosphoric acid, | 2.116 | .346 | .192 | .185 |
| Water and organic matter, | 9.594 | 12.655 | 7.745 | 9.390 |
| Silicious matter, | 41.640 | 11.860 | 52.650 | 24.620 |
| | 99.444 | 99.934 | 100.000 | 100.000 |



* By difference.

| | | | | |
|---|---|---|---|---|
| Metallic iron, | 27.100 | 51.000 | 23.550 | 42.650 |
| Metallic manganese, | .360 | .337 | .014 | .070 |
| Sulphur, | .011 | .031 | trace. | .062 |
| Phosphorus, | .924 | .151 | .084 | .081 |
| Phosphorus in 100 parts iron, | 3.405 | .296 | .356 | .189 |

(*105*) *John C. Long*, Liverpool township, three miles from Susquehanna river.

(*106*) *Mr. Schuyler's land*, on north west side of Perry Furnace ridge, three miles south west of Perry furnace. *Marcellus brown hematite.*

Cellular; brittle; dark brown.

(*107*) *Henry Smith's land*, in Sandy Hollow, two miles north west from Gibson's mill. Red ore mined for making paint.

*In the Corniferous shale.*

Generally compact and fine-grained; shaly; reddish brown.

(*108*) *One mile south west of Rinesmith's farm*, in Sandy Hollow, north east of Gibson rock. *Brown hematite of VII.*

Hard and compact; some portions of sample shaly; iridescent; carries some adhering yellow clay; various shades of brown. (J. M. S.)

*Fossil ores.*

*Perry County.*

| | (*109*) *Seidel.* |
|---|---|
| Metallic iron, | 25.500 |
| Sulphur, | .014 |
| Phosphorus, | .267 |
| Silicious matter, | 45.220 |
| Phosphorus in 100 parts iron, | 1.047 |

(*109*) *J. B. Seidel's lands*, one mile south west of Marysville, on north west side of Little mountain. On top of Hamilton SS. *Montebello fossil ore.*

Rather soft; structure shaly; oolitic; dark brown. (J. M. S.)

*Perry County.*

| | (*110*) *Lickel.* | (*111*) *Cook.* |
|---|---|---|
| Sesquioxide of iron, | 47.285 | 44.857 |
| Sesquioxide of manganese, | trace. | .062 |

| | | |
|---|---|---|
| Alumina, | 7.989* | 5.650 |
| Lime, | .300 | .640 |
| Magnesia, | .810 | .313 |
| Sulphuric acid, | .079 | .077 |
| Phosphoric acid, | .572 | 1.083 |
| Water and organic matter, | 6.955 | 9.995 |
| Silicious matter, | 36.010 | 37.160 |
| | 100.000 | 99.837 |
| Metallic iron, | 33.100 | 31.400 |
| Metallic manganese, | trace. | .043 |
| Sulphur, | .031 | .031 |
| Phosphorus, | .250 | .473 |
| Phosphorus in 100 parts iron, | .755 | 1.506 |

(*110*) *From an old working on Lewis Lickel's land*, on south east side of Dick's hill, three miles south west from Juniata river. *Montebello fossil ore; from top bed of ore.*

Rather soft; dark brown and reddish brown. Somewhat coated with white clay. (J. M. S.)

(*111*) *Philip Cook's land*, Polecat valley, in Mahonoy valley; on the south west side of Mahonoy ridge; two and three quarter miles south west from the Juniata river. *Montebello fossil ore; top bed.* 6″ to 8″ thick.

Shaly; comparatively soft and brittle; dark brown.

*Perry County.*

| | (*112*) *Cumbler.* |
|---|---|
| Metallic iron, | 35.775 |
| Sulphur, | .010 |
| Phosphorus, | .731 |
| Silicious matter, | 31.740 |
| Phosphorus in 100 parts iron, | 2.043 |

(*112*) *Cumbler property*, Miller township; one half mile north west from the Cook property; on left side of ravine. Dr. Harry Stites, Newport. *Montebello fossil ore.*

Rather coarse grained; argillaceous; reddish brown.

*Perry County.*

| | (*113*) | (*114*) | (*115*) | (*116*) |
|---|---|---|---|---|
| | *George Peterman.* | | | |
| Sesquioxide of iron, | 41.714 | 33.428 | 44.143 | 40.714 |
| Sesquioxide of manganese, | .110 | .220 | .352 | .042 |
| Alumina, | 9.037 | 12.143 | 9.381 | 3.764 |

* By difference.

| | | | | |
|---|---|---|---|---|
| Lime, | .560 | .610 | .570 | .230 |
| Magnesia, | .428 | .536 | .407 | .583 |
| Sulphuric acid, | .025 | .025 | .037 | .029 |
| Phosphoric acid, | 1.399 | .719 | 1.376 | .478 |
| Water and organic matter, | 10.745 | 7.385 | 9.685 | 4.485 |
| Silicious matter, | 35.620 | 44.690 | 34.070 | 48.980 |
| | 99.638 | 99.756 | 100.021 | 99.305 |
| Metallic iron, | 29.200 | 23.400 | 30.900 | 28.250 |
| Metallic manganese, | .079 | .158 | .253 | .030 |
| Sulphur, | .010 | .010 | .015 | .011 |
| Phosphorus, | .611 | .314 | .601 | .209 |
| Phosphorus in 100 parts iron, | 2.092 | 1.341 | 1.945 | .739 |

(*113*) *George Peterman's land;* Duncannon Iron Co., lessees. Polecat valley, in Mahonoy valley, on the south east side of Mahonoy ridge, three miles south west of Juniata river. *Montebello ore. Top division of ore;* upper bed 8″ to 10″ thick.

Soft; crumbling; shaly; dark brown; structure somewhat laminated.

(*114*) *George Peterman's land;* Duncannon Iron Co., lessees. Polecat valley, in Mahonoy valley, on the south east side of Mahonoy ridge, three miles south west of Juniata river. *Montebello ore. Middle division of ore=the bottom division of the upper ore bed.* 8′ to 10″ thick.

Soft; crumbling; very shaly; reddish brown.

(*115*) *George Peterman's land;* Duncannon Iron Co., lessees. Polecat valley, in Mahonoy valley, on the south east side of Mahonoy ridge, three miles south west of Juniata river. *Montebello ore. Top bed of ore.* Soft ore, 18″ thick.

Comparatively soft; shaly; reddish brown.

(*116*) *George Peterman's land;* Duncannon Iron Co., lessees. Polecat valley, in Mahonoy valley, on the south east side of Mahonoy ridge, three miles south west of Juniata river. *Montebello ore. Bottom bench of ore=lower of the two ore beds*, 8″ thick.

Rather coarse-grained and sandy; full of fossil casts; somewhat porous; reddish brown.

*Perry County.*

| | (117) | (118) | (119) |
|---|---|---|---|
| | *B. G. Mush & Co.* | | *Michael's Ridge.* |
| Sesquioxide of iron, | 78.571 | 73.714 | 55.285 |
| Sesquioxide of manganese, | .021 | .021 | .051 |
| Alumina, | 4.927 | 5.702 | 7.553 |
| Lime, | .510 | .390 | .650 |
| Magnesia, | .213 | .209 | .400 |
| Sulphuric acid, | .042 | .050 | .030 |
| Phosphoric acid, | 1.502 | 1.784 | .382 |
| Water and organic matter, | 6.015 | 9.075 | 5.690 |
| Silicious matter, | 8.170 | 8.870 | 30.490 |
| | 99.971 | 99.815 | 100.531 |
| Metallic iron, | 55.000 | 51.600 | 38.700 |
| Metallic manganese, | .015 | .015 | .036 |
| Sulphur, | .016 | .020 | .012 |
| Phosphorus, | .656 | .779 | .167 |
| Phosphorus in 100 parts iron, | 1.192 | 1.509 | .431 |

(*117*) *B. G. Mush & Co.*, south east side of Tuscarora mountain, one fourth mile north from Millerstown, on the north east side of the Juniata river. *Sand vein fossil ore.* Sample represents the quality of the greater part of the ore bed, 10″ to 12″ thick.

Rather coarse grained and friable ; reddish brown.

(*118*) *B. G. Mush & Co.*, south east side of Tuscarora mountain, one fourth mile north from Millerstown, on the north east side of the Juniata river. Sample represents the character of ore 3″ to 4″ thick in bed.

Hard and tough ; rather fine grained ; dark brown and reddish brown ; small masses of shale in specimens.

(*119*) *On south east side of Tuscarora mountain* (Michael's Ridge) ; one fourth mile north west of Millerstown, and a few hundred rods north east of Juniata river. *Fossil ore of V*, 8″ thick ; from ore sandstone—7′ from top.

Compact ; specimen consists of a mixture of hard and soft ore ; reddish brown. (J. M. S.)

*Perry County.*

*Red hematite of IX.*

| | (120) |
|---|---|
| | *Basom.* |
| Sesquioxide of iron, | 86.000 |
| Sesquioxide of manganese, | .072 |
| Alumina, (by difference,) | 1.848 |

| | |
|---|---|
| Lime, | .750 |
| Magnesia, | .403 |
| Sulphuric acid, | .040 |
| Phosphoric acid, | .082 |
| Water and organic matter, | .975 |
| Silicious matter, | 9.830 |
| | 100.000 |
| Metallic iron, | 60.200 |
| Metallic manganese, | .050 |
| Sulphur, | .016 |
| Phosphorus, | .036 |
| Phosphorus in 100 parts iron, | .059 |

(*120*) *Christian Basom's land*, in Wildcat Valley, two miles northeast of Juniata river. Where opened it is 4″ thick.

Red specular iron ore; comparatively soft and micaceous; color, generally deep red.

| | *Juniata County.* | |
|---|---|---|
| | *Brown hematite of VIII.* (*121*) *Clark.* | *Fossil ore of V.* (*122*) *Venormer.* |
| Sesquioxide of iron, | 73.393 | 62.714 |
| Sesquioxide of manganese, | 1.205 | .455 |
| Alumina, | 1.540 | 4.696 |
| Lime, | .580 | .310 |
| Magnesia, | .130 | .497 |
| Sulphuric acid, | .675 | .010 |
| Phosphoric acid, | .261 | .430 |
| Water organic matter, | 14.150 | 4.600 |
| Silicious matter, | 8.160 | 26.040 |
| | 100.094 | 99.752 |
| Metallic iron, | 51.375 | 43.900 |
| Metallic manganese, | .839 | .317 |
| Sulphur, | .270 | .004 |
| Phosphorus, | .114 | .188 |
| Phosphorus in 100 parts iron, | .221 | .428 |

(*121*) *Mr. Clark's land*, three miles south west of New Waterford, on the Limestone Ridge north west of Tuscarora mountain. *Marcellus brown hematite.*

Brittle; cellular; dark-brown and yellowish-brown.

(*122*) On *Joshua Venormer's land*, 15 miles east from Mifflintown, 6 miles north of Thompsontown, in Fayette township. Fossil ore, 22″ thick. Sample taken by Jacob Smith.

Rather soft; somewhat oolitic; carries a small amount of specular iron ore; light-brown and reddish-brown.

(J. M. S.)

## *Mifflin County.*

*Fossil ore of V.*

| | (*123*) *J. J. Dull.* |
|---|---|
| Sesquioxide of iron, | 71.571 |
| Sesquioxide of manganese, | .682 |
| Alumina, | 4.493 |
| Lime, | .560 |
| Magnesia, | .342 |
| Sulphuric acid, | .035 |
| Phosphoric acid, | .614 |
| Water and organic matter, | 4.753 |
| Silicious matter, | 16.950 |
| | 100.000 |
| Metallic iron, | 50.100 |
| Metallic manganese, | .475 |
| Sulphur, | .014 |
| Phosphorus, | .268 |
| Phosphorus in 100 parts iron, | .534 |

(*123*) *J. J. Dull's ore opening* in Oliver township, about one and one fourth miles north of Dunkard church, on old mountain road, Jack's mountain. *Fossil ore of V.* Sample selected by Mr. Dull.

Coarse-grained; oolitic; reddish-brown. A portion of the specimen was in fine powder and rather argillaceous.

*Mifflin County—Carbonate ore.*

| | (*124*) *Robt. McCormick.* |
|---|---|
| Metallic iron, | 28.325 |
| Sulphur, | .306 |
| Phosphorus, | .036 |
| Silicious matter, | 30.170 |
| Phosphorus in 100 parts iron, | .127 |

(*124*) *Robt. McCormick's* ore opening in Oliver township, four miles south west from McVeytown. *Carbonate ore of VIII (?).*

Soft; fine grained; argillaceous; pearl gray color.

## *Huntingdon County.*

*Brown hematites.*

| | (*125*) *Shade.* | (*126*) *Taylor.* |
|---|---|---|
| Sesquioxide of iron, | 53.857 | 66.571 |
| Sesquioxide of manganese, | .275 | .510 |
| Alumina, (by difference,) | 2.861 | 1.606 |
| Lime, | .690 | .710 |
| Magnesia, | .313 | .285 |
| Sulphuric acid, | .190 | .075 |
| Phosphoric acid, | .114 | .323 |
| Water and organic matter, | 13.200 | 13.580 |
| Silicious matter, | 28.500 | 16.340 |
| | 100.000 | 100.000 |
| Metallic iron, | 37 700 | 46.600 |
| Metallic manganese, | .191 | .355 |
| Sulphur, | .076 | .030 |
| Phosphorus, | .050 | .141 |
| Phosphorus in 100 parts iron, | .132 | .302 |

(*125*) *Property of Dr. J. A. Shade*, two miles south west from Shade Gap, Shade valley. Outcrop of *Marcellus ore bed.*

Brittle ; cellular ; full of seams of ochreous iron ore ; color generally light-brown. Ore carries a large amount of carbonaceous matter.

(*126*) *Property of Isaac Taylor*, three miles south west from Shade Gap. *Marcellus ore bed.*

Cellular ; brittle ; light and dark brown ; ore carries considerable carbonaceous matter.

*Huntingdon County.*

| | (*127*) *Addleman.* |
|---|---|
| Sesquioxide of iron, | 82.928 |
| Sesquioxide of manganese, | .020 |
| Alumina, (by difference,) | 1.175 |
| Lime, | .550 |
| Magnesia, | .119 |
| Sulphuric acid, | .067 |
| Phosphoric acid, | .061 |
| Water and organic matter, | 11.510 |
| Silicious matter, | 3.570 |
| | 100.000 |
| Metallic iron, | 58.050 |
| Metallic manganese, | .014 |
| Sulphur, | .027 |
| Phosphorus, | .027 |
| Phosphorus in 100 parts iron, | .046 |

(*127*) *From property of Mr. Wm. B. Addleman*, near Warriors Mark. Sample sent to Laboratory by Rev. W. V. Ganoe. *Brown hematite of II.*

Very hard and generally compact; botryoidal; with fibrous brown oxide of iron; dark brown. (J. M. S.)

*Huntingdon County—Fossil ores.*

| | (*128*) *Dull & Bradley.* | (*129*) *Dull & Bradley.* |
|---|---|---|
| Sesquioxide of iron, | 71.571 | 42.928 |
| Sesquioxide of manganese, | trace. | .403 |
| Alumina, (by difference,) | 4.512 | 1.363 |
| Lime, | 1.630 | 24.380 |
| Magnesia, | .619 | 1.895 |
| Sulphuric acid, | trace. | trace. |
| Phosphoric acid, | .998 | 1.021 |
| Carbonic acid, | none. | 19.710 |
| Water, | 4.940 | 1.900 |
| Silicious matter, | 15.730 | 6.400 |
| | 100.000 | 100.000 |
| Metallic iron, | 50.100 | 30.050 |
| Metallic manganese, | trace. | .281 |
| Sulphur, | trace. | trace. |
| Phosphorus, | .436 | .446 |
| Phosphorus in 100 parts iron, | .870 | 1.484 |

(*128*) *On property of Dull & Bradley*, three quarters of a mile south of Mapleton. White & Rex. *Fossil ore of V. Soft fossil.*

Comparatively soft; shows small scales of specular iron ore; color, various shades of brown. (J. M. S.)

(*129*) *On property of Dull & Bradley*, three quarters of a mile south of Mapleton. White & Rex. *Fossil ore of V. Hard fossil.*

Compact; brittle; dark brown and reddish brown. (J. M. S.)

*Huntingdon County.*

| | (*130*) *McCarthy.* |
|---|---|
| Sesquioxide of iron, | 22.571 |
| Sesquioxide of manganese, | .713 |
| Alumina, | 2.610 |
| Lime, | 17.250 |
| Magnesia, | 1.675 |
| Sulphuric acid, | .072 |
| Phosphoric acid, | .742 |
| Carbonic acid, | 11.980 |

| | |
|---|---|
| Water, | 4.018 |
| Silicious matter, | 38.510 |
| | 100.141 |
| Metallic iron, | 15.800 |
| Metallic manganese, | .497 |
| Sulphur, | .029 |
| Phosphorus, | .324 |
| Phosphorus in 100 parts iron, | 2.050 |

(*130*) *A. R. McCarthy, M. D.*, Mount Union. Ore from Clear Ridge, (Smith's Valley side,) Union township, about three and one half miles from Mapleton depot, P. R. R. *Fossil ore of VIII* (?).

Dark reddish brown; sandy looking.

*Fulton County.*

*Brown Hematites.*

| | (*131*) *Trout.* | (*132*) *Awl.* |
|---|---|---|
| Sesquioxide of iron, | 47.500 | 66.428 |
| Sesquioxide of manganese, | 6.227 | .132 |
| Sesquioxide of cobalt, | .310 | — |
| Alumina. | 3.120 | 2.024* |
| Lime, | 3.210 | .720 |
| Magnesia, | .562 | .270 |
| Sulphuric acid, | .040 | .170 |
| Phosphoric acid, | 2.553 | .121 |
| Water and organic matter, | 10.850 | 11.315 |
| Silicious matter, | 25.040 | 18.820 |
| | 99.412 | 100.000 |
| Metallic iron, | 33.250 | 46.500 |
| Metallic manganese, | 4.323 | .092 |
| Sulphur, | .016 | .068 |
| Phosphorus, | 1.115 | .053 |
| Phosphorus in 100 parts iron, | 3.353 | .113 |

(*131*) *From land of Wm. Trout*, one mile south east from Fort Littleton. *Brown hematite of VI,(?)* scattered on the top of the limestone ridge.

Cellular; full of seams of oxide of manganese; generally dark brown.

(*132*) *From the land of P. Awl & Bro.*, on the north west side of Sydney Knob, three fourths mile north west of Burnt Cabins. *Marcellus brown hematite.*

Generally fine-grained and compact; hard and brittle; color, various shades of dark brown and reddish brown.

* By difference.

## *Bedford County.*

*Fossil Ores.*

| | (133) James Sill. Upper. | (134) James Sill. Lower. |
|---|---|---|
| Metallic iron, | 38.625 | 25.825 |
| Phosphorus, | .299 | .301 |
| Carbonate of lime, | 27.578 | 48.114 |
| Carbonate of magnesia, | 1.210 | 1.059 |
| Silicious matter, | 10.720 | 10.120 |
| Phosphorus in 100 parts iron, | .774 | 1.166 |

(*133*) *James Sill*, Bedford, Napier twp. *Fossil ore of V; upper layer.*

Coarse-grained, with considerable micaceous iron ore; shows small particles of calcareous matter. Color, reddish brown.

(*134*) *James Sill*, Bedford, Napier twp. *Fossil ore of V; lower layer.*

Coarse-grained; considerable calcareous matter throughout; reddish brown and grey.

## *Centre County.*

*Brown Hematite.*

| | (135) Addleman. |
|---|---|
| Sesquioxide of iron, | 67.642 |
| Sesquioxide of manganese, | .195 |
| Sesquioxide of cobalt, | .020 |
| Alumina, | 4.068 |
| Lime, | 1.470 |
| Magnesia, | .151 |
| Sulphuric acid, | 1.780 |
| Phosphoric acid, | .100 |
| Water and organic matter, | 19.344 |
| Silicious matter, | 5.230 |
| | 100.000 |
| Metallic iron, | 47.350 |
| Metallic manganese, | .136 |
| Sulphur, | .712 |
| Phosphorus, | .044 |
| Phosphorus in 100 parts iron, | .092 |

(*135*) *Wm. B. Addleman's property*, Taylor twp., near Hannah furnace, above Fowler's station, on Bald Eagle Ridge.

Cellular; soft; ochreous; light brown and reddish brown. (J. M. S.)

## *Clinton County.*

*Brown Hematites.*

| | (*136*) Salona Ore Bank. | (*137*) |
|---|---|---|
| | *Lump.* | *Wash.* |
| Sesquioxide of iron, | 77.071 | 74.785 |
| Sesquioxide of manganese, | .030 | .030 |
| Sesquioxide of cobalt, | trace. | trace. |
| Alumina, | .593 | 2.053 |
| Lime, | .630 | .640 |
| Magnesia, | .468 | .508 |
| Sulphuric acid, | .087 | .097 |
| Phosphoric acid, | .036 | .132 |
| Water and organic matter, | 12.650 | 11.978 |
| Silicious matter, | 8.380 | 9.780 |
| | 99.945 | 100.003 |
| Metallic iron, | 53.950 | 52.350 |
| Metallic manganese, | .021 | .021 |
| Sulphur, | .035 | .039 |
| Phosphorus, | .016 | .058 |
| Phosphorus in 100 parts iron, | .029 | .110 |

(*136*) *Salona ore bank*, Nittany valley, Porter township. *Lump* (*Kidney*) *ore.*

(*137*) *Salona ore bank*, Nittany valley, Porter township. *Wash ore.*

Limonite, botryoidal; dark brown; small masses of quartz throughout specimens.

## *Lycoming County.*

*Fossil Ores.*

| | (*138*) | (*139*) Young's Ore Bank. | (*140*) |
|---|---|---|---|
| | *Upper.* | *Middle.* | *Lower.* |
| Sesquioxide of iron, | 30.000 | 42.857 | 43.928 |
| Sesquioxide of manganese, | .145 | .248 | .300 |
| Alumina, | 5.051 | 5.975 | 4.568 |
| Lime, | 1.100 | 1.720 | 1.300 |
| Magnesia, | 1.116 | 1.037 | 1.000 |
| Sulphuric acid, | .015 | .022 | .005 |
| Phosphoric acid, | .439 | .868 | .694 |
| Carbonic acid, | 1.277 | 1.289 | 1.075 |
| Water, | 2.773 | 3.971 | 3.925 |
| Silicious matter, | 58.120 | 41.980 | 42.570 |
| | 100.036 | 99.967 | 99.365 |

| | | | |
|---|---|---|---|
| Metallic iron, | 21.000 | 30.000 | 30.750 |
| Metallic manganese, | .101 | .173 | .209 |
| Sulphur, | .006 | .009 | .002 |
| Phosphorus, | .192 | .379 | .303 |
| Phosphorus in 100 parts iron, | .914 | 1.263 | .985 |

(*138*) *J. Young's ore bank*, on the south side of the Susquehanna river, near Antes Fort, opposite Jersey Shore, and about two miles south from it. *Fossil ore of V. Upper layer.*

Compact; fine-grained; sandy; with lenticular masses of slate; reddish brown.

(*139*) *J. Young's ore bank*, on the south side of the Susquehanna river, near Antes Fort, opposite Jersey Shore, and about two miles south from it. *Fossil ore of V. Middle layer.*

Compact; fine-grained; sandy; with numerous shot-like phosphatic pebbles.

(*140*) *J. Young's ore bank*, on the south side of the Susquehanna river, near Antes Fort, opposite Jersey Shore, and about two miles south from it. *Fossil ore of V. Lower layer.*

Same general appearance as No. (139.)

*Lycoming County.*

| | (*141*) *McGowan.* | (*142*) *Quiggleville.* | (*143*) *Hayes* | (*144*) *Furnace Run.* |
|---|---|---|---|---|
| Sesquioxide of iron, | 40.714 | 46.643 | 49.857 | 42.857 |
| Sesquioxide of manganese, | .103 | .300 | .248 | .186 |
| Alumina, | 5.269 | 5.476 | 3.774 | 4.690 |
| Lime, | 1.620 | 1.760 | 6.270 | 1.450 |
| Magnesia, | .828 | 1.030 | 1.693 | .881 |
| Sulphuric acid, | trace. | trace. | trace. | trace. |
| Phosphoric acid, | .907 | 1.101 | 1.759 | .863 |
| Carbonic acid, | none. | none. | 2.590 | none. |
| Water, | 3.710 | 4.310 | 4.060 | 3.705 |
| Silicious matter, | 56.630 | 39.220 | 29.130 | 44.830 |
| | 99.781 | 99.840 | 99.381 | 99.462 |
| Metallic iron, | 28.500 | 32.650 | 34.900 | 30.000 |
| Metallic manganese, | .072 | .209 | .173 | .130 |
| Sulphur, | trace. | trace. | trace. | trace. |
| Phosphorus, | .396 | .481 | .768 | .377 |
| Phosphorus in 100 parts iron, | 1.389 | 1.473 | 2.200 | 1.256 |

(*141*) *McGowan mine*, Piatt township, two miles north east from Jersey Shore; Stewart's run. *Fossil ore of VIII.*

Generally compact; highly fossiliferous; with some phosphatic pebbles; color, reddish brown.

(*142*) *Quiggleville mine*, at Quiggleville, one mile north west from Perryville, Lycoming township; just south of Mr. Stiber's house. *Chemung fossil ore.*

Rather compact and fine-grained; fossiliferous; with some phosphatic pebbles; color, reddish brown.

(*143*) *Hayes mine*, on Lycoming creek, Hepburn township; one third mile north of Cogan Station, N. C. R.R. *Chemung fossil ore.*

Rather coarse-grained; highly fossiliferous; carries numerous phosphatic pebbles. Color, reddish brown and reddish grey.

(*144*) *Furnace run mines*, on the north side of Furnace run, close to the south line of Watson township, and near the old Safe Harbor furnace; six miles north west of Jersey Shore. *Chemung fossil ores.*

Rather fine-grained; fossiliferous; shaly; reddish brown.

*Lycoming county—Carbonate ore.*

| | (*145*) *Cartersville.* |
|---|---|
| Metallic iron, | 31.000 |
| Metallic manganese, | .288 |
| Sulphur, | trace. |
| Phosphorus, | .075 |
| Alumina, | 1.004 |
| Lime, | 1.250 |
| Magnesia, | 1.549 |
| Silicious matter, | 28.770 |
| Phosphorus in 100 parts iron, | .241 |

(*145*) *Cartersville furnace*, McIntyre township; one mile north from McIntyre station, N. C. R.R. *Carbonate ore of XI.*

Exceedingly hard and tough; fine-grained; crust hematitic; fresh fracture glistens with small scales of mica. Color, reddish grey.

## *Sullivan county.*

*Carbonate ores.*

| | (146) Ganoga | (147) Lake. |
|---|---|---|
| Metallic iron, | 20.575 | 15.950 |
| Sulphur, | .007 | .012 |
| Phosphorus, | .386 | .076 |
| Silicious matter, | 46.650 | 62.890 |
| Phosphorus in 100 parts iron, | 1.876 | .476 |

(*146*) *Near Ganoga lake. Vein under the Conglomerate.*
Carbonate ore; coarse grained; hard and tough; sandy; greenish grey.

(*147*) *At Ganoga lake. Vein over yellow ochre.*
Carbonate ore; somewhat oxidized; very coarse grained; sandy; greenish grey and reddish brown.

## *Jefferson County.*

*Brown hematites.*

| | (148) Perry Kahle. | (149) Butterfield. |
|---|---|---|
| Sesquioxide of iron, | 62.500 | 34.714 |
| Sesquioxide of manganese, | .620 | 3.537 |
| Alumina, | 2.172 | 1.312 |
| Lime, | .650 | .580 |
| Magnesia, | .396 | .216 |
| Sulphuric acid, | .072 | .082 |
| Phosphoric acid, | .778 | .364 |
| Water and organic matter, | 10.684 | 6.944 |
| Silicious matter, | 22.340 | 52.850 |
| | 100.212 | 100.599 |
| Metallic iron, | 43.750 | 24.300 |
| Metallic manganese, | .432 | 2.464 |
| Sulphur, | .029 | .033 |
| Phosphorus, | .340 | .159 |
| Phosphorus in 100 parts iron, | .777 | .654 |

(*148*) *Perry Kahle*, two miles west of Sigel, Eldred township.
Limonite, dark brown to yellowish brown; structure more or less laminated; considerably coated with a pinkish clay.

(*149*) *Owen Butterfield*, Barnet township.
Dark brown to yellowish brown; structure laminated; inside of specimen contains numerous lenticular masses of soft sandrock.

*Jefferson county—Carbonate ore.*

| | (*150*) *Magiffin.* |
|---|---|
| Bisulphide of iron, | .052 |
| Protoxide of iron, | 37.607 |
| Sesquioxide of iron, | 3.214 |
| Protoxide of manganese, | 1.776 |
| Protoxide of cobalt, | trace. |
| Alumina, | 1.634 |
| Lime, | 6.600 |
| Magnesia, | 2.594 |
| Sulphuric acid, | trace. |
| Phosphoric acid, | .572 |
| Carbonic acid, | 30.791 |
| Water, | 1.350 |
| Silicious matter, | 13.810 |
| | 100.000 |
| Metallic iron, | 31.524 |
| Metallic manganese, | 1.376 |
| Sulphur, | .028 |
| Phosphorus, | .250 |
| Phosphorus in 100 parts iron, | .793 |

(*150*) *J. S. Magiffin*, two and a half miles south west of Brookville, Rose township. *Buhrstone iron ore.*

Exceedingly hard and tough plate ore; full of small drusy cavities; fracture irregular, slightly conchoidal; color, brownish grey.

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## *Armstrong County.*

The principal iron ores of Armstrong county are found at the horizon of the Ferriferous limestone. These ores have long been mined and have been the principal source of supply for the blast furnaces of the county. The ore occurs both as a brown hematite and as a carbonate. The former is usually very rich in iron, averaging, when properly mined, nearly 50 per cent. metallic iron; and as the percentage of phosphorus is not excessive a very good quality of mill iron can be made from its use. The average thickness of the ore is only about eight inches; but as it occurs directly in contact with the Ferriferous limestone—which is the flux used in the furnace—it can be easily and profitably mined. The carbonate ore is always roasted before being smelted; and at some of the furnaces it is customary to roast both varie-

ties of the ore. For this purpose the slack coal is generally used. Besides adding by its ash a considerable percentage of silicious matter to the roasted ore it not unfrequently carries quite a large percentage of phosphorus* which materially affects the quality of the pig iron produced. This question has already been discussed by Mr. Wm. G. Platt in his report on Armstrong county, volume H⁵, pp. lvii to lxiii, so that no further reference to it is here necessary.

*Armstrong County.*

*Brown hematites.*

| | (151) | (152) | (153) | (154) |
|---|---|---|---|---|
| | *Stewardson furnace.* | | | *Campbell & Barrett.* |
| Protoxide of iron, | none. | none. | none. | none. |
| Sesquioxide of iron, | 73.143 | 70.714 | 73.928 | 68.928 |
| Sesquioxide of manganese, | 1.386 | 2.421 | 1.344 | 2.048 |
| Sesquioxide of cobalt, | trace. | .010 | .020 | trace. |
| Alumina, | 1.691 | 1.491 | 1.532 | 1.358 |
| Lime, | 4.920 | 7.630 | 1.610 | 8.670 |
| Magnesia, | .800 | .547 | .501 | .576 |
| Sulphuric acid, | .010 | .010 | trace. | .012 |
| Phosphoric acid, | .636 | .765 | .740 | .584 |
| Carbonic acid, | 3 980 | 5.230 | none. | 6.980 |
| Water, | 8.800 | 7.465 | 12.615 | 6.600 |
| Silicious matter, | 4.800 | 3.860 | 8.060 | 4.370 |
| | 100.166 | 100.143 | 100.350 | 100.126 |
| Metallic iron, | 51.200 | 49.500 | 51.750 | 48.250 |
| Metallic manganese, | .965 | 1.686 | .936 | 1.426 |
| Sulphur, | .004 | .004 | trace. | .005 |
| Phosphorus, | .278 | .334 | .323 | .255 |
| Phosphorus in 100 parts iron, | .542 | .674 | .624 | .528 |

(*151*) *At Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Ferriferous limestone ore.*

Very compact and fine grained; exceedingly brittle, with rough irregular fracture. Irregularly seamed with calcite. Numerous pits filled with white pulverulent silicate of alumina. Reddish brown.

(*152*) *At Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Ferriferous limestone ore.* "*Red ore.*"

*See table of "Phosphorus in Coals and Cokes," page 78.

Very compact and fine grained ; exceedingly brittle, with rough irregular fracture. Irregularly seamed with calcite. Generally reddish brown.

(*153*) *At Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Ferriferous limestone ore.* "*Brown ore.*"

Cellular ; also fine grained ; dark brown and yellowish brown.

(*154*) *Campbell & Barrett*, one mile north west of Centreville, Madison township. *Ferriferous limestone ore.*

Exceedingly compact and fine grained ; hard and tough, with rough, irregular fracture ; somewhat conchoidal ; numerous pits of pulverulent silicate of alumina. Reddish brown.

*Armstrong County.*

| | (*155*) *Stewardson.* |
|---|---|
| Protoxide of iron, | none. |
| Sesquioxide of iron, | 65.928 |
| Sesquioxide of manganese, | 1.563 |
| Sesquioxide of cobalt, | .020 |
| Alumina, | 2.688 |
| Lime, | 7.710 |
| Magnesia, | .901 |
| Sulphuric acid, | .580 |
| Phosphoric acid, | 1.074 |
| Carbonic acid, Water, absorbed, | 5.365 |
| Silicious matter, | 14.520 |
| | 100.349 |
| Metallic iron, | 46.150 |
| Metallic manganese, | 1.088 |
| Sulphur, | .232 |
| Phosphorus, | .469 |
| Phosphorus in 100 parts, | 1.016 |

(*155*) *Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Ferriferous limestone ore.* "*Mixed ores roasted.*"

*Armstrong County.*

| | (156) *Stewardson furnace, "Ore screenings."* |
|---|---|
| Metallic iron, | 24.600 |
| Metallic manganese, | 1.232 |
| Sulphur, | .528 |
| Phosphorus, | .544 |
| Alumina, | 14.328 |
| Lime, | 6.030 |
| Magnesia, | .691 |
| Silica, | 31.800 |
| Phosphorus in 100 parts iron, | 2.211 |

(*156*) *Stewardson furnace*, one mile east of mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Ore screenings.*

*Armstrong County—Carbonate Iron Ores.*

| | (157) *Colwell.* | (158) *Brady's Bend.* | (159) *Stewardson.* |
|---|---|---|---|
| Bisulphide of iron, | .062 | .090 | .187 |
| Protoxide of iron, | 41.464 | 38.378 | 42.428 |
| Sesquioxide of iron, | 10.310 | 2.646 | 2.233 |
| Protoxide of manganese, | 2.353 | 1.153 | .799 |
| Protoxide of cobalt, | trace. | trace. | .010 |
| Alumina, | 1.919 | 1.223 | .916 |
| Lime, | 4.690 | 10.840 | 7.150 |
| Magnesia, | 2.054 | 2.666 | 1.881 |
| Sulphuric acid, | trace. | trace. | .030 |
| Phosphoric acid, | .623 | .480 | .334 |
| Carbonic acid, | 31.450 | 32.074 | 32.622 |
| Water, | 1.315 | 1.910 | 1.950 |
| Silicious matter, | 3.760 | 8.540 | 9.460 |
| | 100.000 | 100.000 | 100.000 |
| Metallic iron, | 39.500 | 31.750 | 34.650 |
| Metallic manganese, | 1.823 | .893 | .619 |
| Sulphur, | .029 | .042 | .112 |
| Phosphorus, | .272 | .224 | .146 |
| Phosphorus in 100 parts iron, | .688 | .705 | .421 |

(*157*) *J. A. Colwell*, one half mile north west of Mahoning furnace, in Madison township. *Ferriferous limestone ore.*

Rather coarse-grained and porous; more or less oxidized throughout; mottled with calcite; color, generally reddish grey.

(*158*) *Brady's Bend Iron Company*, in Brady's Bend

township, one mile south west of Brady's Bend. Ore from Phillip's hill. *Ferriferous limestone ore.*

Crust hematitic; exceedingly hard and tough; rather fine-grained; fracture irregular, rough; color, reddish grey.

(*159*) *Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Blue Carbonate ore.*

Rather hard and tough; coarse-grained; bluish grey.

*Armstrong County.*

| | (*160*) *Brown, Neale & Orr.* |
|---|---|
| Iron as carbonate, | 27.267 |
| Iron as bisulphide, | 8.733 |
| Total metallic iron, | 36.000 |
| Sulphur, | 9.981 |
| Phosphorus, | .350 |
| Silicious matter, | 12.520 |
| Phosphorus in 100 parts iron, | .972 |

(*160*) *Brown, Neale & Orr*, near Allegheny furnace, two and one half miles north west from Kittanning, in Valley township. *Carbonate ore under Kittanning Lower coal.*

Exceedingly hard and tough; fine-grained; dark bluish grey. Large quantities of iron pyrites in minute crystals disseminated throughout the mass. (J. M. S.)

## *Clarion County.*

*Carbonate Ores.*

| | (*161*) *Sligo.* | (*162*) *Fox.* | (*163*) *Hindman.* |
|---|---|---|---|
| Bisulphide of iron, | .109 | ·491 | .009 |
| Protoxide of iron, | 44.357 | 48.535 | 38.571 |
| Sesquioxide of iron, | 2.857 | 1.101 | 2.142 |
| Protoxide of manganese, | 2.101 | 1.282 | 1.756 |
| Protoxide of cobalt, | trace. | trace. | trace. |
| Alumina, | .743 | .528 | 1.027 |
| Lime, | 6.380 | 5.650 | 6.750 |
| Magnesia, | 2.248 | 2.396 | 1.992 |
| Sulphuric acid, | trace. | trace. | trace. |
| Phosphoric acid, | .643 | .277 | 2.333 |
| Carbonic acid, | 33.333 | 36.109 | 29.403 |
| Water, | 1.789 | .711 | 2.137 |
| Silicious matter, | 5.440 | 2.920 | 13.880 |
| | 100.000 | 100.000 | 100.000 |

| | | | |
|---|---|---|---|
| Metallic iron, | 36.550 | 38.750 | 31.500 |
| Metallic manganese, | 1.628 | .994 | 1.361 |
| Sulphur, | .058 | .262 | .005 |
| Phosphorus, | .281 | .121 | 1.019 |
| Phosphorus in 100 parts iron, | .768 | .312 | 3.234 |

(*161*) *Sligo Furnace bank*, Piney township. *Ferriferous limestone ore.*

Specimen more or less oxidized; calc-spar in thin plates; somewhat cellular; bluish grey and reddish grey.

(*162*) *Fox farm*, Piney township. *Ferriferous limestone ore. Plate ore.*

Very fine grained; full of little pits partially filled with calc-spar; rather hard and tough; bluish grey.

(*163*) *Hindman's quarry*, Clarion township. *Ferriferous limestone ore.* Ore occurs in balls.

Hard and tough; rather coarse grained; surface somewhat oxidized; bluish grey.

*Clarion County.*

| | (*164*) *Fairmount Coal Co.* |
|---|---|
| Carbonate of iron, | 37.596 |
| Sesquioxide of iron, | 1.571 |
| Alumina, | 4.851 |
| Carbonate of lime, | 25.089 |
| Carbonate of magnesia, | 6.008 |
| Sulphur, | .083 |
| Phosphorus, | .474 |
| Silicious matter, | 20.100 |
| Metallic iron, | 19.250 |
| Phosphorus in 100 parts iron, | 2.462 |

(*164*) *Fairmount Coal Company's* quarry, at New Bethlehem, in Red Bank township. From the horizon of the *Johnstown Cement bed.*

Reddish grey; brittle, with irregular fracture.

## *Forest County.*

*Brown Hematite.*

| | (*165*) *A. B. Kelly.* |
|---|---|
| Sesquioxide of iron, | 58.000 |
| Sesquioxide of manganese, | 3.032 |
| Alumina, (by difference,) | 2.107 |
| Lime, | .870 |
| Magnesia, | .230 |
| Sulphuric acid, | .030 |

| | |
|---|---|
| Phosphoric acid, | .831 |
| Water and organic matter, | 11.220 |
| Silicious matter, | 23.680 |
| | 100.000 |
| Metallic iron, | 40.600 |
| Metallic manganese, | 2.111 |
| Sulphur, | .012 |
| Phosphorus, | .363 |
| Phosphorus in 100 parts iron, | .894 |

(*165*) *A. B. Kelly*, at Tionesta, in Tionesta township, 500 feet, more or less, above the Allegheny river. *Brown hematite of the Coal Measures.*

More or less cellular; somewhat coated with a yellowish white clay. Generally dark brown. (J. M. S.)

## *Butler County.*

### *Carbonate Iron Ores.*

| | (*166*) *Hindman.* |
|---|---|
| Metallic iron, | 36.600 |
| Sulphur, | .052 |
| Phosphorus, | .493 |
| Silicious matter, | 23.905 |
| Phosphorus in 100 parts iron, | 1.347 |

(*166*) *The Hindman farm*, three miles from Harrisville. Sample sent to Laboratory by Mr. Harry Snyder, Sharon.

A mixture of dark blue carbonate ore with cellular brown hematite. Rough, irregular fracture.

*Butler County.*

| | (*167*) *Mobly.* |
|---|---|
| Carbonate of iron, | 47.642 |
| Sesquioxide of iron, | 1.500 |
| Alumina, | 5.390 |
| Carbonate of lime, | 20.803 |
| Carbonate of magnesia, | 4.964 |
| Sulphur, | .133 |
| Phosphorus, | .508 |
| Silicious matter, | 15.920 |
| Metallic iron, | 24.050 |
| Phosphorus in 100 parts iron, | 2.112 |

(*167*) *Major Mobly's opening*, at Argyle; horizon of the *Kittanning Upper limestone.*

Brecciated; comparatively soft; bluish grey.

*Mercer County.*

*Carbonate Ore.*

| | (168) Wm. Walker. |
|---|---|
| Metallic iron, | 26.800 |
| Sulphur, | .632 |
| Phosphorus, | .366 |
| Silicious matter, | 29.510 |
| Phosphorus in 100 parts iron, | 1.365 |

(*168*) *Wm. Walker.* Ore from Fairview township, about one half mile from Otter creek; about five miles north of Mercer; twelve miles from Greenville; and one mile above Coolspring station on the Shenango and Allegheny railroad. (J. M. S.)

*Crawford County.*

*Carbonate Ore.*

| | (169) Snodgrass. |
|---|---|
| Metallic iron, | 32.925 |
| Sulphur, | .038 |
| Phosphorus, | .213 |
| Silicious matter, | 18.090 |
| Phosphorus in 100 parts iron, | .646 |

(*169*) *From land of Robt. Snodgrass*, one and one fourth miles from Jamestown, Mercer county. Sample sent to Laboratory by Mr. Harry Snyder, Sharon.

Argillaceous, bluish gray; with small pits of pulverulent silicate of alumina; fracture irregular.

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## CHAPTER II.

### Coals and Cokes.

In this chapter are included the analyses of ninety-two coals and ten cokes from Armstrong, Clarion, Jefferson, Elk, Cameron, Clinton, Lycoming, Sullivan, and Bradford counties. They represent chiefly the coals of the Lower Productive Coal Measures; and as a description of the different coal beds has already been given in Report MM., these analyses are published without further comment.

## Coals.

| | *Armstrong County.* | | | |
|---|---|---|---|---|
| | (*170*) | (*171*) | (*172*) | (*173*) |
| | *Ewing.* | *Schrecengost.* | *Patterson.* | *Beer.* |
| Water @ 225°, | .800 | .910 | 1.020 | 1.140 |
| Volatile matter, | 36.900 | 34.270 | 36.995 | 37.860 |
| Fixed carbon, | 50.230 | 53.224 | 53.569 | 57.179 |
| Sulphur, | 3.040 | 2.311 | 2.641 | 1.031 |
| Ash, | 9.030 | 9.285 | 5.775 | 2.790 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | pinkish-grey. | grey. | cream. | cream. |
| Coke, per cent., | 62.300 | 64.820 | 61.985 | 61.000 |
| Fuel ratio, | 1 : 1.36 | 1 : 1.55 | 1 : 1.45 | 1 : 1.51 |

(*170*) *H. M. Ewing's mine*, Elder's Ridge, two miles south west of West Lebanon. *Pittsburgh coal.*

Luster dull black; very compact; numerous partings of pyrites.

(*171*) *B. U. Schrecengost's mine*, two miles west of Rural village, Cowanshannock township. *Freeport Lower coal.*

Luster generally deep black; alternating bands of bright crystalline coal and dull black coal make up the mass. Very firm and compact.

(*172*) *J. F. Patterson's property*, two miles west of Rural village, Cowanshannock township. *Gallitzin coal.*

Luster deep black; generally very firm. Partings of charcoal and pyrites rather numerous.

(*173*) *Beer's estate*, at North Star, three miles south west of Rural village, Cowanshannock township. *Freeport upper coal.*

Luster deep black; firm and compact; shows numerous partings of mineral charcoal and some pyrites.

| | *Armstrong County.* | |
|---|---|---|
| | (*174*) | (*175*) |
| | *Rhea.* | *Marshall.* |
| Water @ 225°, | .960 | 1.040 |
| Volatile matter, | 38.205 | 32.330 |
| Fixed carbon, | 52.032 | 49.450 |
| Sulphur, | 3.663 | 2.000 |
| Ash, | 5.140 | 15.180 |
| | 100.000 | 100.000 |
| Color of ash, | reddish grey. | grey. |
| Coke, per cent., | 60.835 | 66.630 |
| Fuel ratio, | 1 : 1.36 | 1 : 1.53 |

(*174*) *J. C. Rhea's coal*, one half mile east of Greensdale, Valley township. *Kittanning Lower coal.*

Luster dull; firm and compact; partings of pyrites numerous.

(*175*) *T. H. Marshall's property*, one half mile west of Dayton, Wayne township. *Freeport Upper coal.*

Luster deep black; firm and compact; bands of ashy coal throughout specimens. Shows considerable charcoal and pyrites.

*Armstrong County.*

| | *Mrs. Thompson's Mine.* | | |
|---|---|---|---|
| | (*176*) *Upper bench.* | (*177*) *Middle bench.* | (*178*) *Lower bench.* |
| Water @ 225°, | 1.220 | 1.610 | .810 |
| Volatile matter, | 37.830 | 37.820 | 34.465 |
| Fixed carbon, | 52.757 | 53.132 | 54.482 |
| Sulphur, | 1.388 | .678 | .588 |
| Ash, | 6.705 | 6.750 | 9.655 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | grey, red tinge. | grey. | grey. |
| Coke, per cent., | 60.850 | 60.560 | 64.725 |
| Fuel ratio, | 1 : 1.39 | 1 : 1.40 | 1 : 1.58 |

(*176*) *Mrs. Thompson's mine*, two miles south west of New Salem, Red Bank township. *Kittanning Upper coal bed; upper bench.*

Luster dull; very firm and compact; thin partings of pyrites rather numerous; laminæ somewhat indistinct.

(*177*) *Mrs. Thompson's mine*, two miles south west of New Salem, Red Bank township. *Kittanning Upper coal bed; top of middle bench.*

Dull black, cannel-like; fracture irregular, somewhat conchoidal.

(*178*) *Mrs. Thompson's mine*, two miles south west of New Salem, Red Bank township. *Kittanning Upper coal bed; bottom of middle bench.*

Luster dull, cannel-like; fracture irregular, somewhat conchoidal; laminæ indistinct.

*Armstrong County.*

| | (179) *Brooks.* | (180) *Colwell.* | (181) *Colwell.* |
|---|---|---|---|
| Water @ 225°, | .640 | 1.450 | 1.070 |
| Volatile matter, | 32.665 | 34.810 | 37.110 |
| Fixed carbon, | 52.306 | 54.996 | 50.265 |
| Sulphur, | 1.044 | 1.054 | 3.225 |
| Ash, | 13.345 | 7.690 | 8.330 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | grey. | grey. | pinkish grey. |
| Coke, per cent., | 66.695 | 63.740 | 61.820 |
| Fuel ratio, | 1 : 1.60 | 1 : 1.58 | 1 : 1.35 |

(*179*) *Brooks mine*, on Cathcart run, two miles northeast of Putneyville. *Kittanning Upper coal bed.*

Luster dull, cannel-like; somewhat coated with silt; bands of ashy coal throughout specimens.

(*180*) *J. A. Colwell*, one half mile north west of Putneyville. *Freeport Upper coal.*

Luster deep black; somewhat coated with a yellowish white silt; numerous partings of charcoal.

(*181*) *J. A. Colwell*, one half mile north west of Mahoning furnace. *Freeport Lower coal.*

Deep black, firm and compact, with numerous partings of pyrites.

*Armstrong County.*

| | (182) *Stewardson furnace.* | (183) *Mahoning Coal Co.* |
|---|---|---|
| Water @ 225°, | 1.470 | 1.180 |
| Volatile matter, | 35.520 | 42.550 |
| Fixed carbon, | 55.545 | 49.686 |
| Sulphur, | .835 | 1.999 |
| Ash, | 6.630 | 4.585 |
| | 100.000 | 100.000 |
| Color of ash, | yellowish grey. | pinkish grey. |
| Coke, per cent., | 63.010 | 56.270 |
| Fuel ratio, | 1 : 1.56 | 1 : 1.17 |

(*182*) *At Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Freeport Upper coal.*

Hard, compact, brittle; with deep black, shining luster. Shows considerable mineral charcoal and some pyrites.

(*183*) *Mahoning Coal Company*, at mouth of Mahoning creek. *Kittanning Lower Coal.*

Hard, brittle, deep black; with numerous thin partings of pyrites.

*Armstrong County.*

| | (*184*) *Mortimer.* | (*185*) *Reynolds.* | (*186*) *Reed.* | (*187*) *Laufman & Co.* |
|---|---|---|---|---|
| Water @ 225°, . . . | .740 | .950 | 1.010 | 1.410 |
| Volatile matter, . . | 35.715 | 40.855 | 40.210 | 38.560 |
| Fixed carbon, . . . | 51.049 | 51.694 | 47.366 | 52.249 |
| Sulphur, . . . . . | .936 | 1.366 | 3.824 | 2.381 |
| Ash, . . . . . | 11.560 | 5.135 | 7.590 | 5.400 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, . . . . | cream. | white. | cream. | cream. |
| Coke, per cent., . | 63.545 | 58.195 | 58.780 | 60.030 |
| Fuel ratio, . . . . . | 1:1.43 | 1:1.26 | 1:1.18 | 1:1.35 |

(*184*) *From the bluff opposite Mr. John Mortimer's house*, near Slabtown, Boggs township. *Brookville coal.*

Luster dull, with bands of ashy coal throughout specimens. Some portions have the general appearance of a cannel coal. Shows considerable pyrites in minute specks throughout the mass.

(*185*) *Ross Reynold's property*, one half mile north of Kittanning, Valley township. *Kittanning Lower coal.*

Deep black, shining luster; generally firm and compact; seems in the main free from slate and pyrites.

(*186*) *D. Reed's coal*, Centre Hill, three miles west of Kittanning. *Freeport Lower coal.*

Firm and compact; luster dull black; more or less stained iron oxide; considerable mineral charcoal and iron pyrites in thin partings.

(*187*) *Laufman & Co.*, at Apollo, Kiskiminitas township. *Freeport Upper coal.*

Coal, of a deep black color, is seamed with mineral charcoal and iron pyrites. It carries an unusually large amount of carbonate of lime in thin scales disseminated throughout the mass.

| | *Armstrong County.* | | | |
|---|---|---|---|---|
| | (*188*) *Hagy.* | (*189*) *Rogers.* | (*190*) *Winfield Furnace.* | (*191*) *Wangler.* |
| Water @ 225°, | 1.430 | 1.160 | 1.010 | 1.310 |
| Volatile matter, | 39.835 | 42.720 | 42.650 | 45.025 |
| Fixed carbon, | 50.206 | 48.742 | 48.661 | 46.916 |
| Sulphur, | 2.819 | 2.313 | 1.644 | 2.954 |
| Ash, | 5.710 | 5.065 | 6.035 | 3.795 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | cream. | reddish grey. | pinkish grey. | pink. |
| Coke, per cent., | 58.735 | 56.120 | 56.340 | 53.665 |
| Fuel ratio, | 1 : 1.26 | 1 : 1.14 | 1 : 1.14 | 1 : 1.04 |

(*188*) *John Hagy's property*, north end of Freeport town, South Buffalo township. *Freeport Upper coal.*

Generally firm and compact; luster deep black, shining; considerable pyrites in thin partings; laminæ rather indistinct.

(*189*) *R. Rogers' mine*, two miles west of Buffalo Mills, on Butler county line. *Kittanning Lower coal.*

Somewhat coated with iron oxide; iridescent; deep black on fresh fracture; considerable pyrites in partings.

(*190*) *Winfield furnace property*, on Rough run, near Winfield furnace, two and one half miles north west of Slate Lick. *Clarion coal.*

Luster generally dull, with bands of bright crystalline coal throughout specimens. Very firm; with pyrites in thin partings.

(*191*) *J. A. Wangler's mine*, on Fox farm, one and one half miles north west of Parker City. *Clarion coal.*

Hard and exceedingly compact; laminæ rather indistinct; luster generally deep black, pitchy; portions of the specimen strongly iridescent. Thin partings of pyrites numerous.

| | *Clarion County.* | | | |
|---|---|---|---|---|
| | (*192*) | (*193*) | (*194*) | (*195*) |
| | *Fairmount Coal Co.'s Mines.* | | | |
| Water @ 225°, | 1.320 | .850 | .930 | 1.050 |
| Volatile matter, | 40.565 | 39.655 | 41.000 | 38.955 |
| Fixed carbon, | 53.980 | 49.787 | 48.571 | 41.357 |
| Sulphur, | 1.490 | 1.548 | 1.534 | 5.773 |
| Ash, | 2.645 | 8.160 | 7.965 | 12.865 |
| | 100.000 | 100.000 | 100.000 | 100.000 |

| | | | | |
|---|---|---|---|---|
| Color of ash, . . . . . | reddish grey. | reddish grey. | white. | pink. |
| Coke, per cent., . . . . | 58.115 | 59.495 | 58.070 | 59.995 |
| Fuel ratio, . . . . . | 1 : 1.33 | 1 : 1.25 | 1 : 1.18 | 1 : 1.06 |

(*192*) *Fairmount Coal Co.'s mines*, near New Bethlehem. *Bank No. 1, Freeport Lower coal.*

Deep black; brittle; laminæ rather indistinct; partings of mineral charcoal rather numerous.

(*193*) *Fairmount Coal Co.'s mines*, near New Bethlehem. *Bank No. 4, Upper bench. Kittanning Lower coal.*

Luster deep black; bands of bright-pitchy coal run throughout the specimens; also bands of greyish black ashy coal.

(*194*) *Fairmount Coal Co.'s mines*, near New Bethlehem. *Bank No. 4, Middle bench. Kittanning Lower coal.*

Same general appearance as No. (*193*).

(*195*) *Fairmount Coal Co.'s mines*, near New Bethlehem. *Bank No. 4, lower bench. Kittanning Lower coal.*

Luster deep black; rather tender; carries an unusually large number of thin partings of iron pyrites more or less decomposed.

| | *Clarion County.* | | | |
|---|---|---|---|---|
| | (*196*) | (*197*) | (*198*) | (*199*) |
| | *Fairmount Coal Co.'s Mines.* | | | |
| Water @ 225°, . . . . . | 4.765 | 1.260 | 1.300 | .900 |
| Volatile matter, . . . . | 35.675 | 35.130 | 35.825 | 39.695 |
| Fixed carbon, . . . . . | 54.037 | 51.397 | 54.223 | 48.405 |
| Sulphur, . . . . . | .913 | 1.988 | 1.312 | 3.440 |
| Ash, . . . . . | 4.610 | 10.225 | 7.340 | 7.510 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, . . . . . | cream. | grey. | grey. | lilac. |
| Coke, per cent., . . . . | 59.560 | 63.610 | 62.875 | 59.355 |
| Fuel ratio, . . . . . | 1 : 1.51 | 1 : 1.43 | 1 : 1.51 | 1 : 1.23 |

(*196*) *Fairmount Coal Co.'s mines*, near New Bethlehem. Average. *Kittanning Middle coal.* Bed 2′ thick.

Luster dull, dead; more or less coated with silt; brittle; shows but little pyrites.

Coal yields an inferior coke, and after being dried absorbs water with great rapidity.

(*197*) *Fairmount Coal Co.'s mines*, near New Bethlehem. *Freeport Lower coal; unwashed slack.*

(*198*) *Fairmount Coal Co.'s mines*, near New Bethlehem. *Freeport Lower coal; washed slack.*

(*199*) *Fairmount Coal Co.'s mines*, near New Bethlehem. *Kittanning Lower coal. Slack coal.*

*Clarion County.*

| | (*200*) Goheen. | (*201*) Goheen. | (*202*) McNutt. | (*203*) McClure. |
|---|---|---|---|---|
| Water @ 225°, | 1.520 | 1.170 | 1.850 | 1.640 |
| Volatile matter, | 35.320 | 39.155 | 38.510 | 37.115 |
| Fixed carbon, | 54.448 | 51.388 | 54.669 | 56.357 |
| Sulphur, | ·672 | 2.067 | 1.046 | 1.163 |
| Ash, | 8.040 | 6.220 | 3.925 | 3.725 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | cream. | grey. | reddish grey. | cream. |
| Coke, per cent., | 63.160 | 59.675 | 59.640 | 61.245 |
| Fuel ratio, | 1:1.54 | 1:1.31 | 1:1.42 | 1:1.51 |

(*200*) *Goheen's bank*, Porter township. *Freeport Upper coal.* Bed 4′ 9″ thick. Average. Sample exposed on dump for some time; probably outcrop coal.

Luster deep black; more or less stained with iron oxide. Bands of slaty coal throughout specimen. Seems in the main free from pyrites.

(*201*) *Goheen's bank*, Porter twp. *Freeport Lower coal.* Bed 7′ thick, with no slate partings.

Luster deep black; generally very firm and compact; partings of pyrites somewhat numerous; shows numerous fossil impressions partially filled in with pyrite.

(*202*) *McNutt's (now Smullen's) mine*, Porter twp. *Freeport Lower coal.* Bed 8′ thick.

Luster dull; somewhat coated with iron oxide; brittle; shows but little pyrites.

(*203*) *J. McClure's (Wilkins') mine*, Porter twp. *Freeport Lower coal.*

Average of lowermost 6′ of coal. Bed 8′ thick; upper 2′ slaty.

Luster, rather dull; somewhat coated with iron oxide; slightly iridescent.

| | *Clarion County.* | | | |
|---|---|---|---|---|
| | (*204*) *Songer.* | (*205*) *Sloan.* | (*206*) *Clarion Coal Co.* | (*207*) *Murphy.* |
| Water @ 225°, | 1.020 | 1.750 | 2.060 | 4.775 |
| Volatile matter, | 40.425 | 36.440 | 38.075 | 35.118 |
| Fixed carbon, | 47.511 | 55.438 | 56.782 | 53.632 |
| Sulphur, | 3.789 | 1.072 | .818 | 1.095 |
| Ash, | 7.255 | 5.300 | 2.265 | 5.380 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | reddish grey. | reddish grey. | cream. | cream. |
| Coke, per cent, | 58.555 | 61.810 | 59.865 | 60.107 |
| Fuel ratio, | 1:1.17 | 1:1.52 | 1:1.49 | 1:1.52 |

(*204*) *Songer's mine*, Shannondale, Red Bank township. *Kittanning Lower coal.* Average sample from run of mine. Bed 3′ to 3′ 4″ thick. No slate partings.

Luster, dull black; considerably coated with iron oxide. Pyrites present in very minute crystals.

(*205*) *Sloan bank*, Limestone township. *Kittanning Lower coal.*

Deep black; somewhat iridescent; laminæ rather indistinct; somewhat coated with iron oxide.

(*206*) *Clarion Coal Co.'s mines*, at Clarion, Clarion township. *Kittanning Lower coal.* Average sample.

Generally very compact; luster, deep black; specimens seen in the main free from pyrites and slate partings.

(*207*) *T. Murphy's bank*, Madison township. *Freeport Lower coal.* Average sample of lot exposed to weather.

Luster, dull black; bands of greyish black coal throughout specimens. Compact and brittle, with somewhat cubical fracture. Coal yields an inferior coke, and when dried reabsorbs water with great rapidity.

| | *Clarion County.* | | | |
|---|---|---|---|---|
| | (*208*) *Sligo Branch Coal Co.* | (*209*) *Somerville.* | (*210*) *Fox.* | (*211*) *McCall.* |
| Water @ 225°, | 1.370 | 1.410 | 1.470 | 2.070 |
| Volatile matter, | 41.575 | 36.900 | 41.355 | 35.695 |
| Fixed carbon, | 49.816 | 46.917 | 49.930 | 55.275 |
| Sulphur, | 2.824 | 1.583 | 2.070 | .830 |
| Ash, | 4.415 | 13.190 | 5.175 | 6.130 |
| | 100.000 | 100.000 | 100.000 | 100.000 |

| | | | | |
|---|---|---|---|---|
| Color of ash, . . . . . | cream. | grey, red tinge. | grey, red tinge. | grey, red tinge. |
| Coke, per cent., . . . . . | 57.055 | 61.690 | 57.175 | 62.235 |
| Fuel ratio, . . . . . | 1: 1.19 | 1: 1.27 | 1: 1.21 | 1: 1.55 |

(*208*) *Sligo Branch Coal Co.*, Rimersburg, Toby township. *Kittanning Lower coal.* Average sample.

Deep black, shining; shows a good deal of pyrites in masses throughout specimens.

(*209*) *T. O. Somerville's bank*, Toby township. *Kittanning middle coal.* Average sample.

Luster, deep black; numerous bands of greyish black ashy coal throughout specimens. Rather compact and brittle.

(*210*) *Fox bank*, Piney township. *Kittanning Lower coal.* Average sample.

Luster, deep black, shining; brittle; pyrites in minute crystals in partings.

(*211*) *McCall's bank*, West Freedom, Perry township. *Kittanning Lower coal.*

Deep black, shining; brittle; shows a small amount of pyrites in minute crystals.

*Jefferson County.*

| | (*212*) *Keslar.* | (*213*) *McCracken.* | (*214*) *Blose.* | (*215*) *Blose.* |
|---|---|---|---|---|
| Water @ 225°, . . . . . | 1.160 | 1.110 | .500 | .880 |
| Volatile matter, . . . . . | 33.020 | 36.023 | 35.125 | 32.173 |
| Fixed carbon, . . . . . | 62.228 | 55.804 | 49.462 | 53.496 |
| Sulphur, . . . . . | 1.062 | 2.593 | 3.498 | 3.361 |
| Ash, . . . . . | 2.530 | 4.470 | 11.415 | 10.090 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, . . . . . | orange. | reddish grey. | grey, pink tinge. | grey, pink tinge. |
| Coke, per cent., . . . . . | 65.820 | 62.867 | 64.375 | 66.947 |
| Fuel ratio, . . . . . | 1:1.88 | 1:1.55 | 1:1.41 | 1:1.66 |

(*212*) *Property of J. Keslar*, four and one half miles north from Punxsutawney. *Freeport Lower coal.*(*?*)

Luster, rather dull; generally firm and compact; thin partings of pyrites.

(*213*) *McCracken Bros.*, one and one half miles west from Frostburg. *Freeport Lower coal.*

Luster, deep black, shining; rather tender; numerous partings of charcoal and pyrites.

(*214*) *From the property of Geo. Blose*, one mile north from Perrysville. *Freeport Lower coal; upper bench.*

Luster, dull black generally; rather compact; appearance somewhat slaty with laminated structure. Very friable, with a tendency to break in plates.

(*215*) *From the property of Geo. Blose*, one mile north from Perrysville. *Freeport Lower coal; lower bench.*

*Jefferson County.*

| | (*216*) *Huffman.* | (*217*) *Eshbaugh.* | (*218*) *Mineweaver.* |
|---|---|---|---|
| Water @ 225°, | 1.540 | 1.390 | 1.350 |
| Volatile matter, | 37.605 | 38.275 | 39.615 |
| Fixed carbon, | 56.762 | 54.720 | 48.532 |
| Sulphur, | 1.103 | 1.525 | 1.238 |
| Ash, | 2.990 | 4.090 | 9.265 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | brown. | cream. | grey. |
| Coke, per cent., | 60.855 | 60.335 | 59.035 |
| Fuel ratio, | 1:1.51 | 1:1.43 | 1:1.22 |

(*216*) *A. Huffman's property*, two miles north-east from Worthville. *Freeport Lower coal.(?)*

Luster, dull; considerably coated with infiltrated silt; somewhat iridescent; seems in the main free from slate partings.

(*217*) *A. Eshbaugh's mine*, one mile west from Knoxville. *Freeport Lower coal.*

Luster, deep black; rather firm and compact; considerable pyrites in thin partings.

(*218*) *From property of Joseph Mineweaver*, three miles north, north west of Brookville. *Brookville coal.*

Deep black, more or less pitchy; very compact; numerous thin partings of pyrites throughout specimens.

*Jefferson County.*

| | (*219*) *Cowan.* | (*220*) *Williams.* |
|---|---|---|
| Water @ 225°, | 1.940 | 2.080 |
| Volatile matter, | 34.440 | 34.065 |
| Fixed carbon, | 54.000 | 51.498 |
| Sulphur, | .890 | .827 |
| Ash, | 8.730 | 11.530 |
| | 100.000 | 100.000 |

| | | |
|---|---|---|
| Color of ash, | grey, red tinge. | grey, red tinge. |
| Coke, per cent., | 63.620 | 63.855 |
| Fuel ratio, | 1:1.56 | 1:1.51 |

(*219*) *W. B. Cowan's mine*, one fourth mile north of Roseville.

Dull black generally; bands of slaty coal throughout specimens; seems in the main free from pyrites.

(*220*) *J. William's mine*, one fourth mile south from Corsica.

Dull black, somewhat iridescent; bands of slaty coal throughout specimens; generally free from pyrites.

*Elk County.*

| | (*221*) *Johnson.* | (*222*) *Brown.* | (*223*) *Wilson.* | (*224*) *Romig.* |
|---|---|---|---|---|
| Water @ 225°, | 2.140 | 1.030 | .920 | .990 |
| Volatile matter, | 31.635 | 32.160 | 32.440 | 31.610 |
| Fixed carbon, | 59.195 | 57.929 | 58.297 | 59.815 |
| Sulphur, | 1.205 | 1.705 | 2.813 | 2.400 |
| Ash, | 5.825 | 7.176 | 5.530 | 5.185 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | reddish grey. | grey, red tinge. | grey, pink tinge. | reddish grey. |
| Coke, per cent., | 66.225 | 66.810 | 66.570 | 67.400 |
| Fuel ratio, | 1:1.87 | 1:1.80 | 1:1.79 | 1:1.89 |

(*221*) *Ben Johnson mine*, Benezette township, three and one half miles north east of Benezette. *Clermont or Clarion coal.* 3′ 10″ thick.

Luster, dull black; considerably coated with silt; very friable; shows but little pyrites.

(*222*) *Geo. Brown's mine*, Benezette township, two and one half miles north east of Benezette. *Clermont or Clarion coal.* 4′ thick.

Luster, generally dull black; considerably coated with silt; rather tender; shows but little pyrites.

(*223*) *H. R. Wilson mine*, Benezette township, two miles north east of Benezette. *Alton (?) coal.* 3′ 10′ thick.

Coal bright and very tender; considerably coated with a white efflorescence of sulphate of iron. Shows some pyrites in thin partings.

(*224*) *Romig mine*, at Benezette, Benezette township. *Alton Upper coal.* 2′ 8″ thick.

Luster, bright; shining; rather tender; numerous thin plates and knife edges of pyrites throughout specimens.

*Elk County.*

| | (225) *Turley.* | (226) *Dennison.* |
|---|---|---|
| Water at 225°, | 1.080 | 1.290 |
| Volatile matter, | 33.335 | 32.455 |
| Fixed carbon, | 58.566 | 54.342 |
| Sulphur, | 1.514 | .753 |
| Ash, | 5.505 | 11.160 |
| | 100.000 | 100.000 |
| Color of ash, | grey. | reddish grey. |
| Coke, per cent., | 65.585 | 66.255 |
| Fuel ratio, | 1 : 1.76 | 1 : 1.67 |

(*225*) *J. E. Turley mine*, Jay township, one half mile north of Weedville. *Alton coal* (*?*). 4′ thick.

Luster, bright, shining; rather firm; shows considerable mineral charcoal and numerous knife edges of pyrites.

(*226*) *V. Dennison mine*, Jay township, Windfall run. *Alton Upper coal* (*?*). 3′ 9″ thick.

Luster rather dull; bands of slaty coal throughout specimens; shows some beautiful stalactitic prolongations of pyrite.

*Elk County.*

| | (227) | (228) | (229) |
|---|---|---|---|
| | *North Western Mining and Exchange Company.* | | |
| Water @ 225°, | 1.700 | .890 | 1.080 |
| Volatile matter, | 36.820 | 33.192 | 38.455 |
| Fixed carbon, | 56.503 | 47.779 | 53.190 |
| Sulphur, | 1.362 | 2.959 | 1.975 |
| Ash, | 3.615 | 15.180 | 5.300 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | brown. | grey, pink tinge. | grey, pink tinge. |
| Coke, per cent., | 61.480 | 65.918 | 60.465 |
| Fuel ratio, | 1 : 1.53 | 1 : 1.44 | 1 : 1.38 |

(*227*) *North Western Mining and Exchange Company's mine*, Daguscahonda P. O., Fox township. *Second bed above the Dagus.* 3′ 7″ thick.

Generally coated with iron oxide; on fresh fracture, deep black; seems in the main free from slate; breaks with somewhat even fracture, showing considerable pyrites in minute crystals.

(*228*) *North Western Mining and Exchange Company's mine*, Daguscahonda P. O., Fox township. *First bed above the Dagus.* 3′ 11″ thick.

Deep black, pitchy: seamed with bands of greyish black ashy coal. Carries considerable iron pyrites in thin partings.

(*229*) *North Western Mining and Exchange Company's mine*, Fox township. *Dagus coal bed.* Average thickness, 3′ 6″.

Deep black, shining; brittle; shows numerous thin parting of pyrites in minute crystals—partially decomposed.

*Elk County.*

| | (*230*) *Hays.* | (*231*) *Eureka mines.* | (*232*) *Eureka mines.* |
|---|---|---|---|
| Water @ 225°, | 1.490 | 1.000 | .990 |
| Volatile matter, | 36.090 | 36.665 | 34.813 |
| Fixed carbon, | 49.199 | 47.766 | 48.219 |
| Sulphur, | 2.866 | 1.579 | 3.338 |
| Ash, | 10.355 | 12.990 | 12.640 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | reddish grey. | grey. | pink. |
| Coke, per cent., | 62.420 | 62.335 | 64.197 |
| Fuel ratio, | 1 : 1.36 | 1 : 1.30 | 1 : 1.38 |

(*230*) *Enos Hays' mine*, Fox township, one mile north west of Kyler's Corners. Thickness of bed, 6 feet.

Dull black; somewhat coated with iron oxide; rather friable; shows partings of pyrites and numerous bands of slaty coal.

(*231*) *Eureka mines*, Peter Connor tract, Daguscahonda R.R., Fox township. D. Eldredge, operator. *Alton middle coal.*

Luster, dull black; generally very compact; numerous bands of bony coal throughout specimens.

(*232*) *Eureka mines*, Peter Connor tract, Daguscahonda

R.R., Fox township. D. Eldredge, operator. *Alton upper coal.*

Luster, generally dull black; specimens show numerous bands of bony coal, and a large amount of iron pyrites in thin partings.

*Elk County.*

| | (233) *Silver Creek mine.* | (234) *St. Mary's Coal Co.* | (235) *St. Mary's Coal Co.* | (236) *St. Mary's Coal Co.* |
|---|---|---|---|---|
| Water @ 225°, | .870 | .990 | 1.190 | 1.050 |
| Volatile matter, | 37.890 | 38.355 | 33.990 | 39.295 |
| Fixed carbon, | 52.657 | 52.826 | 50.992 | 48.001 |
| Sulphur, | .838 | 2.044 | 3.118 | 3.324 |
| Ash, | 7.745 | 5.785 | 10.710 | 8.330 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | cream. | reddish grey. | lilac. | pink. |
| Coke, per cent., | 61.240 | 60.655 | 64.820 | 59.655 |
| Fuel ratio, | 1 : 1.39 | 1 : 1.37 | 1 : 1.50 | 1 : 1.22 |

(*233*) *Silver Creek mine*, Benzinger township D. Eldredge, operator. *Clermont coal.* Average thickness, two feet.

Deep black, shining; brittle; seems in the main free from pyrites.

(*234*) *St. Mary's Coal Co.'s Tannerdale mine*, two miles north east from St. Mary's. *Dagus coal.* Thickness, two feet six inches.

Dull black; more or less coated with iron oxide; partings of pyrites in very minute crystals partly decomposed.

(*235*) *St. Mary's Coal Co.'s mine; east side;* at St. Mary's, Benzinger township. *Dagus coal.* Thickness, three feet two inches.

Dull black; brittle; iridescent; partings of pyrites and slaty coal rather numerous in specimens.

(*236*) *St. Mary's Coal Co.'s mine; west side;* at St. Mary's, Benzinger township. *Dagus coal.* Average thickness, three feet.

Dull black; more or less stained with iron oxide; rather friable; partings of pyrites and slaty coal rather numerous.

*Elk County.*

| | (237) *Cascade.* | (238) *Gresh.* | (239) *Glen Mayo.* | (240) *Gen. Kane.* |
|---|---|---|---|---|
| Water @ 225°, | .990 | .960 | 1.010 | 2.460 |
| Volatile matter, | 40.585 | 34.230 | 38.450 | 37.990 |
| Fixed carbon, | 49.416 | 50.407 | 41.593 | 52.816 |
| Sulphur, | 3.369 | 1.398 | 3.952 | .814 |
| Ash, | 5.640 | 13.005 | 14.995 | 5.920 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | pink. | grey. | lilac. | yellow. |
| Coke, per cent., | 58.425 | 64.810 | 60.540 | 59.550 |
| Fuel ratio, | 1:1.22 | 1:1.47 | 1:1.08 | 1:1.39 |

(*237*) *Cascade mine*, at St. Mary's. *Dagus coal.* Average thickness, 3′ 8″.

Luster, deep black, shining; somewhat coated with silt; shows considerable pyrites partially decomposed.

(*238*) *E. K. Gresh mine*, Ridgway, Ridgway twp. *Marshburg Lower coal*, 2′ 5″ thick.

Luster, dull black; laminæ rather indistinct; numerous bands of slaty coal throughout specimens.

(*239*) *Glen Mayo colliery*, one mile south of Willmarth, Ridgway twp. *Alton coal.*

Luster, rather bright; generally firm and compact; numerous thin bands of bony coal, and a large amount of iron pyrites in thin partings throughout specimens.

(*240*) *Gen. Kane's Roberts' Lot*, Jones twp. *Hoyt bed*, 2′ 11″ thick.

Luster, dull black; appearance somewhat cannel-like; laminæ indistinct; fracture generally irregular, but with a tendency to cubical.

*Cameron County.*

| | (241) *Mt. Hope colliery.* | (242) *Mt. Hope Coal Co.* |
|---|---|---|
| Water @ 225°, | .990 | .920 |
| Volatile matter, | 34.395 | 32.220 |
| Fixed carbon, | 60.195 | 53.904 |
| Sulphur, | .865 | 3.481 |
| Ash, | 3.555 | 9.475 |
| | 100.000 | 100.000 |
| Color of ash, | cream. | pinkish grey. |
| Coke, per cent., | 64.615 | 66.860 |
| Fuel ratio, | 1:1.75 | 1:1.67 |

(*241*) *Mt. Hope colliery*, one mile north west of Cameron Station, Shippen twp. Jacob Elias, proprietor. *Dagus bed*, 3′ thick.

Luster, dull black; generally very firm; somewhat coated with silt. Shows only a few thin scales of pyrites.

(*242*) *Mt. Hope Coal Co's opening*, one half mile west from Mt. Hope colliery, Canoe run, Shippen twp. *Clermont or Clarion bed.* "Five foot bed." 4′ to 5′ thick.

Luster, generally bright, shining; rather firm; shows numerous thin partings or knife edges of pyrites and considerable mineral charcoal.

*Clinton County.*

| | (*243*) *Merriman & Co.* |
|---|---|
| Water at 225°, | .760 |
| Volatile matter, | 21.465 |
| Fixed carbon, | 66.069 |
| Sulphur, | 2.631 |
| Ash, | 9.075 |
| | 100.000 |
| Color of ash, | grey, pink tinge. |
| Coke, per cent., | 77.775 |
| Fuel ratio, | 1:3.08 |

(*243*) *H. Merriman & Co.*, Williamsport.
Luster bright; considerable pyrites in minute crystals.

*Lycoming County.*

| | (*244*) | (*245*) | (*246*) |
|---|---|---|---|
| | *McIntyre Coal Company.* | | |
| Water @ 225°, | .720 | .740 | ·510 |
| Volatile matter, | 17.420 | 17.360 | 16.860 |
| Fixed carbon, | 78.106 | 78.153 | 63.898 |
| Sulphur, | .564 | .567 | .782 |
| Ash, | 3.190 | 3.180 | 17.950 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | grey. | grey. | grey. |
| Coke, per cent., | 81.860 | 81.900 | 82.630 |
| Fuel ratio, | 1: 4.48 | 1: 4.50 | 1: 3.79 |
| Specific gravity, | 1.363 | —— | 1.440 |

(*244*) *McIntyre Coal Co.'s mines*, Ralston. *Coal bed E.*

Color, deep black; luster, shining; generally free from slate and pyrites; seamed with mineral charcoal.

(*245*) Duplicate analysis of (*244*) by John M. Stinson.

(*246*) *McIntyre Coal Co.'s mines*, Ralston. *Coal bed B.*

Dull black; generally free from pyrites; carries numerous bands of slaty coal.

*Lycoming County.*

| | *Red Run Coal Company.* | | | |
|---|---|---|---|---|
| | (*247*) *Carter.* | (*248*) *Old Red Run.* | (*249*) *Butler.* | (*250*) *Old mines.* |
| Water @ 225°, | 1.220 | .730 | .950 | 1.510 |
| Volatile matter, | 15.825 | 16.930 | 16.235 | 16.780 |
| Fixed carbon, | 72.474 | 74.116 | 70.602 | 68.814 |
| Sulphur, | .636 | .677 | .688 | .621 |
| Ash, | 9.845 | 7.547 | 11.525 | 12.275 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, | grey. | grey. | grey, pink tinge. | grey. |
| Coke, per cent., | 82.955 | 82.340 | 82.815 | 81.710 |
| Fuel ratio, | 1: 4.58 | 1: 4.38 | 1: 4.35 | 1: 4.10 |

(*247*) *Carter opening*, on the mountain on the west side of Lycoming creek. Red Run Coal Company. *Coal bed B.*

Dull black; iridescent; somewhat coated with silt; carries thin slate partings.

(*248*) *Old Red Run mines*, Red Run Coal Company. Ralston coal basin. *Coal bed B.*

Deep black; iridescent; rather tender; somewhat coated with iron oxide.

(*249*) *Butler opening*, Red Run, Red Run Coal Company. Ralston coal basin, west of Lycoming creek. *Coal bed E.*

Luster, dull; somewhat coated with iron oxide; generally very firm; numerous thin partings of mineral charcoal.

(*250*) *At old mines*, Hoagland's run, in south east corner of Cogan House township.

Coal has a dull black luster; is generally firm and compact, and seems in the main free from pyrites; it yields an inferior quality of coke and reabsorbs water rapidly.

*Lycoming County.*

*English Mine.*

| | (*251*) *Upper Bench.* | (*252*) *Middle Bench.* | (*253*) *Lower Bench.* | (*254*) *Average.* |
|---|---|---|---|---|
| Water @ 225°, . . . . | .760 | .900 | .860 | .500 |
| Volatile matter, . . . | 19.700 | 20.250 | 19.820 | 19.945 |
| Fixed carbon, . . . . | 68.390 | 68.962 | 65.328 | 67.697 |
| Sulphur, . . . . . | .675 | .593 | .817 | .533 |
| Ash, . . . . . | 10.475 | 9.295 | 13.175 | 11.325 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, . . . . . | grey. | grey. | grey. | cream. |
| Coke, per cent., . . . | 79.540 | 78.850 | 79.320 | 79.555 |
| Fuel ratio, . . . . . | 1 : 3.47 | 1 : 3.40 | 1 : 3.29 | 1 : 3.34 |

(*251*) *English mine*, two and one half miles to three miles north from English Centre P. O., Pine township. On what were known as the "Herdic lands," now the Weightman property. *Big bed of coal; upper bench.*

Dull black luster; firm and compact; numerous bands of slaty coal and partings of charcoal. Specimens seem in the main free from pyrites.

(*252*) *English mine*, two and one half miles to three miles north form English Centre P. O., Pine township. On what were known as the "Herdic lands," now the Weightman property. *Big bed of coal; middle bench.*

Same general appearance as No. (*251*).

(*253*) *English mine*, two and one half miles to three miles north from English Centre P. O., Pine township. On what were known as the "Herdic lands," now the Weightman property. *Big bed of coal; lower bench.*

Same general appearance as No. (*251*).

(*254*) *English mine*, two and one half miles to three miles north from English Centre P. O., Pine township. On what were known as the "Herdic lands," now the Weightman property. Sample representing the average of the whole of the Big bed.

Dull black luster; firm and compact; numerous bands of slaty coal; seems in the main free from pyrites.

*Lycoming County.*

| | (255) *Bannan.* | (256) *Baché.* | (257) *Long, Borleau & Co.* |
|---|---|---|---|
| Water @ 225°, | 1.020 | .450 | 3.830 |
| Volatile matter, | 21.865 | 20.040 | 22.985 |
| Fixed carbon, | 69.324 | 64.159 | 64.063 |
| Sulphur, | .749 | .656 | .577 |
| Ash, | 7.042 | 14.695 | 8.545 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | cream. | grey. | reddish grey. |
| Coke, per cent., | 77.115 | 79.510 | 73.185 |
| Fuel ratio, | 1 : 3.17 | 1 : 3.20 | 1 : 2.79 |

(*255*) *Bannan mine*, three miles north from English Centre P. O., Pine township. *Coal bed D.*

Considerably coated with silt; has a dull black luster on fresh fracture; rather tender.

(*256*) *J. W. Baché's old mine*, three and one half miles north from English Centre P. O., on Little Pine Creek, Pine township.

Bright resinous luster; generally firm; seems in the main free from pyrites; carries numerous thin bands and lenticular masses of slaty coal.

(*257*) *From property of Long, Borleau & Co.*, (Jas. Long, Sam'l Borleau and Adam R. Reese,) Pine township, east of Little Pine creek. *Coal bed C.* Lower coal bed 4½′ thick. Outcrop. Washed coal.

Deep black; rather friable; seamed with mineral charcoal and bands of greyish black ashy coal; seems in the main free from pyrites; yields an inferior coke.

*Sullivan County.*

| | (258) | (259) *State Line and Sullivan R.R. Co.* | (260) |
|---|---|---|---|
| Water @ 225°, | 4.810 | 15.060 | 7.060 |
| Volatile matter, | 14.085 | 22.680 | 24.816 |
| Fixed carbon, | 64.436 | 50.993 | 55.796 |
| Sulphur, | .549 | .372 | .407 |
| Ash, | 16.120 | 10.895 | 11.921 |
| | 100 000 | 100.000 | 100.000 |
| Color of ash, | reddish grey. | reddish grey. | reddish grey. |
| Fuel ratio, | 1 : 4.57 | 1 : 2.24 | 1 : 2.24 |

(*258*) *State Line and Sullivan R.R. Co.'s mines*, at Bernice. J. O. Blight, superintendent.

Coal of a deep black color; rather friable; much coated with infiltrated silt; partings of slate rather numerous. The coal yields gases burning with a non-luminous flame, but does not have the slightest tendency to form a coherent coke; after being dried it absorbs water with great avidity.

(*259*) *State Line and Sullivan R.R. Co.'s mines*, at Bernice. *Fine coal-wet.*

Luster, dull, dead; appearance shaly; soft and crumbling. Coal does not coke; yields gases which burn with a non-luminous flame. Reabsorbs water very rapidly, 60 per cent. in 2 hours.

(*260*) *Same sample air-dried.*

*Bradford County.*

| | (*261*) *Long Valley Coal Co.* |
|---|---|
| Water @ 225°, | 1.990 |
| Volatile matter, | 18.530 |
| Fixed carbon, | 67.423 |
| Sulphur, | 1.742 |
| Ash, | 10.315 |
| | 100.000 |
| Color of ash, | pinkish grey. |
| Coke, per cent., | 79.480 |
| Fuel ratio, | 1 : 3.64 |

(*261*) *Long Valley Coal Co.'s opening*, two miles north east of Barclay.

Deep black; rather brittle; small knife edges of pyrites throughout specimens.

COKES.

| | *Lycoming County.* | *Clinton County.* | | *Armstrong County.* |
|---|---|---|---|---|
| | (*262*) *McIntyre Coal Co.* | (*263*) *Merriman & Co.* | (*264*) *Merriman & Co.* | (*265*) *Stewardson Furnace.* |
| Water @ 225°, | .405 | 1.000 | .325 | 1.380 |
| Volatile matter, | .891 | 1.467 | .760 | .794 |
| Fixed carbon, | 89.123 | 91.405 | 86.090 | 85.122 |
| Sulphur, | .689 | 2.038 | 1.775 | .968 |
| Ash, | 8.892 | 4.090 | 11.050 | 11.736 |
| | 100.000 | 100.000 | 100.000 | 100.000 |

| | | | | |
|---|---|---|---|---|
| Color of ash, . . . . . | reddish grey. | reddish grey. | reddish grey. | reddish grey. |

(*262*) *McIntyre Coal Company*, Ralston, Lycoming county. *Coke from unwashed coal.*

Luster dull; generally rather close-grained; lenticular masses of slate throughout specimens. Coke comparatively easily crushed.

(*263*) *Merriman & Co.*, Williamsport, Clinton county. *Coke from 4′ seam of coal. From lump coal.*

Rather close-grained; luster dull.

(*264*) *Merriman & Co.*, Williamsport, Clinton county. *Coke from 4′ seam of coal. From slack coal.*

Rather close-grained; luster dull; contains considerable slate.

(*265*) *Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township, Armstrong county. F. B. & A. Laughlin. *Coke made in open pits at works, from Freeport Upper coal.*

Very open and tender; luster dull; considerable slate throughout.

| | *Clarion County.* | | | |
|---|---|---|---|---|
| | (*266*) | (*267*) | (*268*) | (*269*) |
| | *Fairmount Coal Company.* | | | |
| Water @ 225°, . . . . | .210 | .030 | .020 | .020 |
| Volatile matter, . . . | .738 | .623 | .603 | .510 |
| Fixed carbon, . . . . | 82.904 | 85.777 | 82.898 | 84.588 |
| Sulphur, . . . . . | 1.360 | 2.107 | 2.936 | 2.672 |
| Ash, . . . . . | 14.788 | 11.462 | 13.543 | 12.210 |
| | 100.000 | 100.000 | 100.000 | 100.000 |
| Color of ash, . . . . | reddish grey. | red. | red. | reddish brown. |

(*266*) *Fairmount Coal Company*, New Bethlehem. *Coke from Freeport Lower washed slack coal.*

Luster silvery; structure rather dense; numerous lenticular masses of slate, especially in center of specimen.

(*267*) *Fairmount Coal Company*, near New Bethlehem. *Coke from washed slack, Freeport Lower coal.*

Structure open; luster bright and silvery; small masses of slate throughout specimens.

(*268*) *Fairmount Coal Company*, near New Bethlehem. *Coke from washed slack, Kittanning Upper coal.*

Structure rather dense generally; luster for the most part bright, silvery. Considerable slate throughout specimens.

(*269*) *Fairmount Coal Company*, near New Bethlehem. *Coke from Kittanning Lower slack coal.*

Bright, silvery; rather close-grained and dense; small lenticular masses of slate throughout specimen.

*Clarion County.*

| | (*270*) *Red Bank Furnace.* | (*271*) *Sligo Branch Coal Co.* |
|---|---|---|
| Water @ 225°, | .230 | 2.090 |
| Volatile matter, | 1.106 | 2.826 |
| Fixed carbon, | 88.360 | 84.248 |
| Sulphur, | 1.076 | 1.764 |
| Ash, | 9.228 | 9.072 |
| | 100.000 | 100.000 |
| Color of ash, | reddish grey. | reddish grey. |

(*270*) *Red Bank furnace*, Madison township. *Coke from Freeport Upper coal.*

Dull grey; structure rather open; somewhat iridescent; small masses of slate throughout specimens.

(*271*) *Sligo Branch Coal Company*, Reimersburg, Toby township. *Coke from Kittanning Lower coal.*

Appearance, dull, dirty; structure very open; numerous particles of slate throughout specimens.

*Table showing the percentage of phosphorus in certain coals and cokes.*

| No. of analysis. | Name of Coal. | County. | Coal bed. | Phosphorus in coal. | Phosphorus in coke. |
|---|---|---|---|---|---|
| 180 | J. A. Colwell, | Armstrong, | Freeport Upper coal, | .0015 | .0023 |
| 181 | J. A. Colwell, | Armstrong, | Freeport Lower coal, | .0092 | .0148 |
| 182 | Stewardson furnace, | Armstrong, | Freeport Upper coal, | .0684 | .1085 |
| 265 | Stewardson furnace, | Armstrong, | Coke from Freeport Upper coal, | —— | .0130 |
| 183 | Mahoning Coal Co., | Armstrong, | Kittanning Lower coal, | .0061 | .0108 |
| 186 | D. Reed, | Armstrong, | Freeport Lower coal, | .0013 | .0022 |
| 187 | Laufman & Co., | Armstrong, | Freeport Upper coal, | .0030 | .0049 |
| 189 | R. Rogers, | Armstrong, | Kittanning Lower coal, | .0011 | .0019 |
| 190 | Winfield furnace, | Armstrong, | Clarion coal, | .1374 | .2438 |
| 192 | Fairmount Coal Co., | Clarion, | Freeport Lower coal, | .0011 | .0019 |
| 198 | Fairmount Coal Co., | Clarion, | Freeport Lower-washed slack coal, | .0061 | .0088 |
| 269 | Fairmount Coal Co., | Clarion, | Coke from Kittanning Lower slack coal, | —— | .0120 |
| 203 | J. McClure, (Wilkins,) | Clarion, | Freeport Lower coal, | .0265 | .0432 |
| 208 | Sligo Branch Coal Co., | Clarion, | Kittanning Lower coal, | .0010 | .0017 |
| 210 | Fox bank, | Clarion, | Kittanning Lower coal, | .0044 | .0076 |
| 213 | McCracken Bro.'s, | Jefferson, | Freeport Lower coal, | .0010 | .0016 |
| 216 | A. Huffman, | Jefferson, | Freeport Lower coal (?), | .0008 | .0013 |
| 224 | Romig, | Elk, | Alton Upper coal, | .0019 | .0028 |
| 225 | J. E. Turley, | Elk, | Alton coal (?), | .0012 | .0018 |
| 227 | N. W. Mining and Exchange Co., | Elk, | (?) | trace. | trace. |
| 229 | N. W. Mining and Exchange Co., | Elk, | Dagus coal bed, | trace. | trace. |
| 234 | St. Mary's Coal Co., | Elk, | Dagus coal bed, | .0012 | .0019 |
| 242 | Mt. Hope Coal Co., | Cameron, | Clarion coal, | .0081 | .0121 |
| 243 | H. Merriman & Co., | Clinton, | (?) | .0009 | .0011 |
| 245 | McIntyre Coal Co., | Lycoming, | Bed E, | .0020 | .0024 |
| 261 | Long Valley Coal Co., | Bradford, | (?) | .0060 | .0076 |

## CHAPTER III.

### Limestones.

A more or less detailed description of the different limestone beds has already been given in Report MM, pp. 281 to 362, so that a repetition is here unnecessary. The analyses given in this report represent the limestones of Formations No. II, Siluro-Cambrian; No. VI, Lewistown limestone; Vo. VIII, Chemung limestone; No. IX, the Catskill limestones; and the limestones from the different horizons in the Coal Measures. The Mesozoic limestones are represented by the specimens from Welty's quarry in York county. These latter are characterized by containing quite a considerable percentage of lime and magnesia in the form of silicates.

*Chester County.*

| | (272) *Swayne.* |
|---|---|
| Carbonate of lime, | 54.071 |
| Carbonate of magnesia, | 43.309 |
| Oxide of iron and alumina, | .613 |
| Sulphur, | .013 |
| Phosphorus, | .003 |
| Silicious matter, | 1.950 |
| | 99.959 |

(*272*) *Benjamin Swayne's quarry*, London Grove twp. *Limestone of II.*

Coarse-grained, crumbling; slightly brownish grey.

*York County.*

| | (*273*) | (*274*) | (*275*) | (*276*) | (*277*) |
|---|---|---|---|---|---|
| | *Welty's quarries.* | | | | |
| Lime, | 44.950 | 44.220 | 47.000 | 42.940 | 43.920 |
| Magnesia, | 5.275 | 6.403 | 3.845 | 3.045 | 2.929 |
| Ferrous oxide, | 1.179 | .864 | .585 | 1.098 | 2.304 |
| Manganous oxide, | trace. | trace. | trace. | trace. | trace. |
| Alumina, | 2.460 | 2.320 | 1.690 | 2.680 | 5.090 |
| Sulphur, | .004 | .003 | .004 | .003 | .005 |
| Phosphorus, | .011 | .012 | .003 | .013 | .031 |

(79 M³.)

| | | | | | |
|---|---|---|---|---|---|
| Carbonic acid, | 31.040 | 34.030 | 34.985 | 30.072 | 17.020 |
| Water, | 1.460 | 1.150 | 1.270 | 1.160 | 1.720 |
| Insoluble residue, | 14.010 | 10.890 | 10.460 | 18.580 | 27.010 |
| | 100.389 | 99.892 | 99.842 | 99.591 | 100.029 |
| The ignited insoluble residues contain: | | | | | |
| Silica, | 11.603 | 8.766 | 7.710 | 13.144 | 25.320 |
| Ferric oxide, | .039 | .148 | .211 | .126 | .113 |
| Alumina, | .236 | .126 | .231 | .524 | .205 |
| Lime, | .838 | .634 | 1.238 | 2.560 | .433 |
| Magnesia, | .666 | .465 | .819 | 1.777 | .304 |

(*273*), (*274*), (*275*), (*276*), (*277*). *Welty's quarries*, on the Dillsburg branch of the C. V. R. R., about a third of a mile north of the depot at Dillsburg. *Mesozoic limestone.*

Brecciated; rather hard and tough, with irregular fracture; color, generally greenish grey. Portions of the mass consist of a white saccharoidal limestone. Some of the specimens show beautiful dendritic impressions.

*Cumberland County.*

| | (*278*) *Pine Grove.* | (*279*) *Craighead.* |
|---|---|---|
| Carbonate of lime, | 72.321 | 86.357 |
| Carbonate of magnesia, | 20.591 | 5.236 |
| Sesquioxide of iron, | 4.420 | .571 |
| Alumina, | .083 | |
| Sesquioxide of manganese, | .433 | none. |
| Sulphur, | .011 | .014 |
| Phosphorus, | .047 | .013 |
| Silicious matter, | 2.310 | 8.410 |

(*278*) *Pine Grove limestone*, at Pine Grove furnace. *Limestone of II.*

Rather hard; light grey and brownish grey; more or less coated and seamed with oxide of iron. (J. M. S.)

(*279*) *Craighead limestone quarry*, two miles north of Mt. Holly. Surface stone. *Limestone of II.*

Rather hard and fine-grained; dark bluish grey. (J. M. S.)

*Franklin County.*

| | (*280*) *Mine No. 3.* | (*281*) *Mine No. 4.* |
|---|---|---|
| Carbonate of lime, | 89.178 | 54.393 |
| Carbonate of magnesia, | .961 | 42.694 |
| Oxide of iron and alumina, | .806 | .941 |
| Phosphorus, | .050 | .013 |
| Silicious matter, | 8.840 | 2.160 |

(*280*) *Limestone from Mine No. 3*, Mont Alto Iron Company, Mont Alto. Sample consisted of 106 pieces.

Rather soft; fracture conchoidal; color, yellowish brown. (J. M. S.)

(*281*) *Limestone from Mine No. 4*, Mont Alto Iron Company, Mont Alto. Sample consisted of 115 pieces.

Rather soft, irregular fracture; light bluish grey. (J. M. S.)

*Franklin County.*

(*282*)

*Shiery quarry.*

| | |
|---|---|
| Carbonate of lime, | 51.743 |
| Carbonate of magnesia, | 43.436 |
| Carbonate of iron, | .665=.321 % iron. |
| Alumina, | .222 |
| Sulphate of lime, | .046=.011 % sulphur. |
| Phosphate of lime, | .065=.013 % phosphorus. |
| Silica, | 4.090 |
| | 100.267 |

(*282*) *Shiery quarry*, one and one half miles north east from Mont Alto. Sample (201 pieces) taken from different places in the several openings.

This deposit represents a true lithological dolomite, as shown by the following figures:

| | *Shiery.* | *Dolomite.* |
|---|---|---|
| Carbonate of lime, | 54.36 | 54.35 |
| Carbonate of magnesia, | 45.64 | 45.65 |
| | 100.00 | 100.00 |

*Franklin County.*

| | (*283*) *S. Z. Hawbecker.* | (*284*) |
|---|---|---|
| Carbonate of lime, | 97.321 | 67.257 |
| Carbonate of magnesia, | 1.286 | 30.702 |
| Oxide of iron and alumina, | .260 | .700 |
| Phosphorus, | .005 | .007 |
| Silica, | .980 | 1.760 |
| | 99.852 | 100.426 |

(*283*) *S. Z. Hawbecker's quarry*, at Williamson. *Best quality.*

(*284*) *S. Z. Hawbecker's quarry*, at Williamson. *Worst quality.*

6 M³.

*Franklin County.*

| | (285) Battin. |
|---|---|
| Carbonate of lime, | 47.375 |
| Carbonate of magnesia, | 15.581 |
| Oxide of iron and alumina, | 6.760 |
| Silica, | 29.640 |
| | 99.356 |

(*285*) *M. E. Battin's cement quarry*, at Scotland.

Sample taken from layer 4′ thick in face of quarry; about the middle of Formation No. II.

A considerable quantity of limestone has been mined here for use as a cement; but the quarry is now abandoned.

*Perry County.*

| | (286) | (287) Newport. | (288) |
|---|---|---|---|
| Carbonate of lime, | 60.214 | 49.178 | 33.482 |
| Carbonate of magnesia, | 1.664 | 1.816 | 1.967 |
| Oxide of iron and alumina, | 5.384 | 5.761 | 8.298 |
| Phosphorus, | .068 | .052 | .084 |
| Silicious matter, | 31.520 | 41.940 | 53.810 |

(*286*) *Near Newport*, on north east side of Juniata river, south of the Newport bridge. 4′ thick. *Chemung limestone.*

Specimen consists of a mass of comminuted shells cemented together in a silicious matrix. Rather compact; reddish grey.

(*287*) Same as No. (*286*), with same general appearance; but more open and of a reddish brown color.

(*288*) Same as No. (*286*), with same general appearance; the shells fewer in number.

*Perry County.*

| | (289) | (290) Thos. Still. |
|---|---|---|
| Carbonate of lime, | 71.732 | 89.642 |
| Carbonate of magnesia, | 7.621 | 1.816 |
| Oxide of iron and alumina, | 2.550 | 1.206 |
| Phosphorus, | .013 | .011 |
| Silicious matter, | 15.720 | 6.530 |

(*289*) *Thos. Still's quarry*, Mahonoy valley, north west

side of Dick's Hill, two miles north east of Montebello narrows. *Lewistown limestone.* 25′ exposed.

Fine-grained; brittle; numerous lenticular masses of bluish black slate; color, generally dark blue.

(*290*) *Thos. Still's quarry*, Mahonoy valley, north west side of Dick's Hill, two miles north east of Montebello narrows. *Lewistown limestone.* 25′ exposed.

This is the general character of the limestone in the exposure; but shows some of No. (*289*).

Rather coarse-grained and brittle; fossiliferous; irregularly seamed and mottled with calcite; bluish grey.

*Armstrong County.*

| | (*291*) *Hamilton.* | (*292*) *Mehaffey & McGill.* | (*293*) *Mehaffey & McGill.* | (*294*) *Mehaffey & McGill.* |
|---|---|---|---|---|
| Carbonate of lime, . . . | 84.857 | 96.453 | 93.214 | 93.571 |
| Carbonate of magnesia, . | 1.868 | 1.445 | 2.065 | 1.324 |
| Oxide of iron and alumina, | 2.568 | .964 | 1.340 | 1.207 |
| Phosphorus, . . . . . | .024 | .007 | .004 | .029 |
| Silicious matter, . . . . | 9.520 | .830 | 2.200 | 3.170 |

(*291*) From *W. R. Hamilton's land*, near the coal mine; one and one half miles north from Putneyville. *Freeport Upper limestone.*

Fine-grained, tough; dark grey.

(*292*) *Mehaffey & McGill's quarry*, three fourths mile east from Logansport. *Freeport Upper limestone; top layer.*

Fine-grained and brittle; dark pearl grey.

(*293*) *Mehaffey & McGill's quarry*, three fourths mile east from Logansport. *Freeport Upper limestone; second layer.*

Fine-grained; tough; dark pearl grey.

(*294*) *Mehaffey & McGill's quarry*, three fourths mile east from Logansport. *Freeport Upper limestone; bottom layer.*

Very compact and fine-grained; hard and tough; light pearl grey with conchoidal fracture.

| | *Armstrong County.* | | |
|---|---|---|---|
| | (*295*) | (*296*) | (*297*) |
| | *Reefer.* | *Marshall.* | *Monroe.* |
| Carbonate of lime, | 88.839 | 94.928 | 94.642 |
| Carbonate of magnesia, | 1.513 | 1.210 | 1.574 |
| Oxide of iron and alumina, | 2.557 | 1.246 | 1.182 |
| Phosphorus, | .021 | .018 | .012 |
| Silicious matter, | 5.030 | 1.920 | 1.850 |

(*295*) *John Reefer's quarry*, three miles south west of Rural Village. *Freeport Upper limestone.*

Fine-grained; tough; mottled with calcite; dark grey; fracture conchoidal.

(*296*) *Wm. Marshall's quarry*, one half mile east of Dayton. *Freeport Upper limestone.*

Fine-grained; tough; mottled with calcite; dark grey.

(*297*) *S. Monroe's quarry*, two miles south west of Slate Lick. *Freeport Upper limestone.*

Fine-grained; tough; dark pearl grey.

| | *Armstrong County.* | | |
|---|---|---|---|
| | (*298*) | (*299*) | (*300*) |
| | | *A. J. Dull & Co.* | |
| Carbonate of lime, | 89.303 | 82.589 | 89.857 |
| Carbonate of magnesia, | 1.900 | 5.751 | 2.898 |
| Oxide of iron and alumina, | 2.002 | 3.367 | 1.860 |
| Phosphorus, | .021 | .063 | .017 |
| Silicious matter, | 4.830 | 7.310 | 4.520 |

(*298*) *A. J. Dull & Co.'s quarries*, in the ravine of Fort run, near Manorville. *Freeport Upper limestone; upper layer.*

Very compact and fine-grained; dark pearl grey, with conchoidal fracture.

(*299*) *A. J. Dull & Co.'s quarries*, in the ravine of Fort run, near Manorville. *Freeport Upper limestone; second layer.*

Fine-grained; hard and tough; somewhat argillaceous; dark pearl grey, with conchoidal fracture; small crystals of pyrite throughout the specimen.

(*300*) *A. J. Dull & Co.'s quarries*, in the ravine of Fort run, near Manorville. *Freeport Upper limestone; third layer.*

Very compact and fine-grained; slightly mottled with calcite; pearl grey, with conchoidal fracture.

*Armstrong County.*

| | (*301*) *Davis.* | (*302*) *Putney.* |
|---|---|---|
| Carbonate of lime, | 53.750 | 64.160 |
| Carbonate of magnesia, | 9.989 | 1.838 |
| Oxide of iron and alumina, | 7.730 | 7.450 |
| Phosphorus, | .131 | .305 |
| Silicious matter, | 23.840 | 22.280 |

(*301*) *M. Davis' limestone*, one half mile south east of Cochran's mills. *Johnstown cement.* Outcrop specimen.

Rather coarse grained; exceedingly hard and tough; bluish grey.

(*302*) *George S. Putney's limestone*, at Putneyville. *Johnstown cement.*

Rather coarse grained; hard and tough; bluish grey; irregularly stained with carbonaceous matter.

*Armstrong County.*

(*303*)

*Stewardson furnace.*

| | | |
|---|---|---|
| Lime, | 53.500=95.535 | % carbonate of lime. |
| Magnesia, | .432= .907 | % carbonate of magnesia. |
| Sesquioxide of iron, | 1.114 | |
| Sesquioxide of manganese, | .206 | |
| Alumina, | .174 | |
| Sulphuric acid, | .064= .025 | % sulphur. |
| Phosphoric acid, | .082= .036 | % phosphorus. |
| Carbonic acid, | 42.399 | |
| Water, | .150 | |
| Silica, | 2.030 | |
| | 100.151 | |

(*303*) *From Stewardson furnace*, one mile east from mouth of Mahoning creek, in Madison township. F. B & A. Laughlin. *Ferriferous limestone.*

Fine grained; full of fossil casts; pearl grey to reddish grey; fracture rough, slightly conchoidal.

*Armstrong County.*

| | (*304*) *Stewardson.* | (*305*) *Colwell.* | (*306*) *Reynolds.* |
|---|---|---|---|
| Carbonate of lime, | 96.007 | 94.721 | 95.567 |
| Carbonate of magnesia, | 1.498 | 1.044 | 1.422 |
| Oxide of iron and alumina, | 1.462 | 1.383 | .930 |
| Phosphorus, | .034 | .047 | .035 |
| Silicious matter, | .790 | 2.300 | 2.110 |

(*304*) *Stewardson furnace* limestone, one mile east from mouth of Mahoning creek, in Madison township. F. B. & A. Laughlin. *Ferriferous limestone.*

Fine-grained; full of fossil casts; pearl grey; with conchoidal fracture.

(*305*) *J. A. Colwell's quarry*, one fourth mile north west from Mahoning furnace. *Ferriferous limestone.*

Rather compact and fine-grained; full of fossil casts; bluish grey; with conchoidal fracture.

(*306*) *Ross Reynolds' limestone*, one half mile north from Kittanning. *Ferriferous limestone.*

Fine-grained; fossiliferous; mottled with calcite; rather tough; light-pearl grey.

*Armstrong County.*

| | (*307*) George. | (*308*) Rhea. | (*309*) Graff. |
|---|---|---|---|
| Carbonate of lime, | 94.185 | 93.246 | 93.292 |
| Carbonate of magnesia, | 1.483 | 1.740 | .968 |
| Oxide of iron and alumina, | 2.089 | 1.667 | 1.713 |
| Phosphorus, | .031 | .032 | .047 |
| Silicious matter, | 2.100 | 3.420 | 3.220 |

(*307*) *P. George*, two miles west from South Bend. *Ferriferous limestone.*

Fine-grained; fossiliferous; mottled with calcite; dark grey.

(*308*) *J. C. Rhea*, one half mile west of Greendale. *Ferriferous limestone.*

Rather coarse-grained; fossiliferous; brittle; bluish grey.

(*309*) *P. Graff*, near Buffalo Mills. *Ferriferous limestone.*

Fine-grained; brittle; more or less stained with ferric oxide; fracture rough, somewhat conchoidal; color, dark grey.

*Clarion County.*

| | (*310*) New Athens. | (*311*) Reichert. | (*312*) Reimersburg. |
|---|---|---|---|
| Carbonate of lime, | 93.803 | 82.678 | 82.000 |
| Carbonate of magnesia, | 2.270 | 8.248 | 6.311 |
| Oxide of iron and alumina, | .765 | 1.365 | 2.736 |
| Phosphorus, | .008 | .022 | .015 |
| Silicious matter, | 1.800 | 5.320 | 7.940 |

(*310*) *At New Athens*, Madison township. *Freeport Upper limestone.*

Rather fine-grained; mottled and seamed with calcite; dark grey.

(*311*) *Reichert's quarry*, Perry township. *Freeport Upper limestone.*

Rather fine-grained; mottled with calcite; dark-pearl grey.

(*312*) *Three miles north east from Reimersburg*, Toby township. *Freeport Lower Limestone.*

Exceedingly hard and tough; mottled and stained with ferric oxide; color, generally bluish grey.

*Clarion County.*

| | (*313*) *Long Run.* | (*314*) *Hindman.* | (*315*) *Sligo furnace.* | (*316*) *Barger.* |
|---|---|---|---|---|
| Carbonate of lime, | 95.232 | 95.532 | 95.196 | 96.428 |
| Carbonate of magnesia, | .407 | .930 | 1.265 | 1.202 |
| Oxide of iron and alumina, | 1.310 | 1.050 | 1.529 | .867 |
| Phosphorus, | .061 | .070 | .081 | .023 |
| Silicious matter, | 2.190 | 1.960 | 1.780 | 1.110 |

(*313*) *On Long Run*, Porter township. *Ferriferous limestone.* Bed five feet to six feet thick, with nine inches carbonate ore overlying.

Brittle; more or less stained with ferric oxide; generally pearl grey.

(*314*) *Hindman's quarry*, Clarion township. *Ferriferous limestone.*

Fine grained; mottled with calcite; rather brittle; bluish grey.

(*315*) *Sligo furnace*, Piney township. *Ferriferous limestone.*

Fine grained; rather tough; stained with ferric oxide; light bluish grey.

(*316*) *Barger quarry* Perry township. *Ferriferous limestone.*

Rather coarse grained; mottled with calcite; bluish grey.

*Jefferson County.*

| | (*317*) *Jas. Smith.* | (*318*) *Jas Smith.* | (*319*) *Jacob. Smith.* |
|---|---|---|---|
| Carbonate of lime, | 92.500 | 75.357 | 77.143 |
| Carbonate of magnesia, | 2.497 | 9.330 | 4.691 |
| Oxide of iron and alumina, | 1.530 | 4.230 | 3.790 |
| Phosphorus, | .023 | .017 | .073 |
| Silicious matter, | 2.390 | 9.780 | 11.780 |

(*317*) *Property of James Smith*, two miles north east from Big Run. *In Lower Barren measures, 200 feet to 225 feet above Freeport upper coal.*

Rather coarse grained ; brittle ; bluish grey.

(*318*) *Property of James Smith*, two miles north east from Big Run. *In Lower Barren measures, 125 feet to 150 feet above the Freeport upper coal.*

Fine grained ; rather hard and tough ; pearl grey.

(*319*) *Property of Jacob Smith*, two miles north from Big Run. *150 feet to 175 feet above Freeport upper coal.*

Fine grained ; rather brittle with conchoidal fracture ; irregularly seemed with calcite ; dark bluish grey.

*Jefferson County.*

| | (*320*) *Lane.* | (*321*) *Iler.* | (*322*) *Iler.* |
|---|---|---|---|
| Carbonate of lime, | 89.107 | 48.571 | 90.000 |
| Carbonate of magnesia, | 1.611 | 23.762 | 2.860 |
| Oxide of iron and alumina, | 2.140 | 7.250 | 1.285 |
| Phosphorus, | .024 | .032 | .011 |
| Silicious matter, | 6.170 | 16.660 | 3.480 |

(*320*) *N. B. Lane's property*, one mile south east from Brockwayville. *Freeport Upper limestone.*

Fine-grained ; brittle ; sparkles with calcite ; generally pearl grey.

(*321*) *John Iler's property*, one mile north west from Perrysville. *Freeport Upper limestone ; upper bench.*

Hard and tough ; appearance, sandy ; fracture, irregular ; color, light pearl grey.

(*322*) *John Iler's property*, one mile north west from Perrysville. *Freeport Upper limestone ; lower bench.*(*?*)

Rather fine-grained ; comparatively brittle ; mottled with calcite ; bluish grey.

*Jefferson County.*

| | (*323*) *Hopkins.* | (*324*) *Huffman.* | (*325*) *Lane.* | (*326*) *Evans Round Top.* |
|---|---|---|---|---|
| Carbonate of lime, | 91.875 | 88.928 | 87.035 | 92.857 |
| Carbonate of magnesia, | 2.421 | 1.589 | 1.558 | 1.680 |
| Oxide of iron and alumina, | 1.312 | 1.740 | 2.170 | 2.320 |
| Phosphorus, | .012 | .023 | .057 | .019 |
| Silicious matter, | 3.130 | 6.770 | 8.400 | 2.070 |

(*323*) *From property of D. Hopkins*, two miles north west from Frostburg. *Freeport limestone.*

Very fine-grained and brittle; mottled with calcite; pearl grey.

(*324*) *From property of A. Huffman*, two miles north east from Worthville. *Freeport limestone.*

Fine-grained; brittle; mottled with calcite; pearl grey.

(*325*) *N. B. Lane's property*, one mile south east from Brockwayville. *Freeport Lower limestone.*

Fine-grained; hard and brittle; brownish grey.

(*326*) *From Evans Round Top*, one half mile east from Corsica. *Freeport Lower limestone.*

Fine-grained; hard and brittle; brownish grey.

*Jefferson County.*

| | (*327*) *Lane.* | (*328*) *Iler.* |
|---|---|---|
| Carbonate of lime, | 51.410 | 82.393 |
| Carbonate of magnesia, | 3.962 | 1.891 |
| Oxide of iron and alumina, | 7.790 | 4.653 |
| Phosphorus, | .033 | .300 |
| Insoluble residue, | 33.900 | 8.020 |

(*327*) *N. B. Lane's property*, one mile south east from Brockwayville. *Johnstown cement bed.*

Hard and tough; argillaceous; more or less stained with iron oxide; color, generally dark grey.

The ignited "insoluble residue" contains: Silica, 27.570; alumina, 4.800; sesquioxide of iron, trace; lime, trace; magnesia, .245. (J. M. S.)

(*328*) *John Iler's property*, one mile north west from Perrysville. *Johnstown cement bed.*

Rather hard and tough; fracture, irregular, rough; dark bluish grey.

*Jefferson County.*

| | (*329*) *Bovaird.* | (*330*) *Hanna.* | (*331*) *Enty.* |
|---|---|---|---|
| Carbonate of lime, | 94.392 | 93.643 | 96.428 |
| Carbonate of magnesia, | 1.702 | 1.816 | .908 |
| Oxide of iron and alumina, | 1.315 | 1.310 | .990 |
| Phosphorus, | .031 | .030 | .034 |
| Silicious matter, | 1.910 | 2.040 | 1.300 |

(*329*) *C. Bovaird*, three miles north west from Brockwayville. *Ferriferous limestone.*

Fine grained ; brittle ; pearl grey.

(*330*) *From property of William Hanna*, two miles north east from Sprankle's mills. *Ferriferous limestone.*

Hard and tough ; fine grained ; full of fossil casts ; dark bluish grey.

(*331*) *From property of A. Enty*, one half mile south east from Worthville. *Ferriferous limestone.*

Fine grained ; brittle ; fossiliferous ; light bluish grey.

*Jefferson County.*

| | (*332*) *Shields.* | (*333*) *Frost.* |
|---|---|---|
| Carbonate of lime, | 96.578 | 39.428 |
| Carbonate of magnesia, | .832 | 1.816 |
| Oxide of iron and alumina, | .780 | 4.760 |
| Phosphorus, | .037 | .041 |
| Silicious matter, | 1.280 | 51.450 |

(*332*) *Samuel Shield's property*, one mile north from Dowlingville. *Ferriferous limestone.*

Rather fine grained ; fossiliferous ; sparkles with calcite ; pearl grey.

(*333*) *Near Frost's house*, four miles north east from Brookville, on Ridgeway road.

Appearance sandy ; exceedingly hard and tough ; fracture, slightly conchoidal ; color, bluish grey.

*Forest County.*

| | (*334*) *Kelley.* |
|---|---|
| Carbonate of lime, | 40.642 |
| Carbonate of magnesia, | 1.172 |
| Oxide of iron and alumina, | 2.120 |
| Phosphorus, | .018 |
| Silicious matter, | 55.160 |

(*334*) *Kelley's quarry*, four miles east from Tionesta, on Tionesta creek ; Saddle Bags tract. *Tionesta limestone ;* two feet to three feet thick.

Coarse grained ; appearance, sandy ; exceedingly hard and tough ; bluish grey.

| | *Elk County.* (*335*) *Hyde.* | (*336*) *Chamberlain.* | (*337*) *McAllister.* | (*338*) *Fox.* |
|---|---|---|---|---|
| Carbonate of lime, | 80.357 | 81.875 | 69.357 | 57.321 |
| Carbonate of magnesia, | 1.619 | 7.189 | 9.308 | 8.854 |
| Oxide of iron and alumina, | 3.610 | 2.750 | 4.835 | 7.940 |
| Phosphorus, | .086 | .066 | .077 | .038 |
| Silicious matter, | 12.290 | 6.540 | 13.680 | 21.250 |

(*335*) *From J. S. Hyde's farm*, Horton township, one mile south from Brandy Camp P. O., on Brandy Camp creek. *Freeport upper limestone.*

Rather coarse grained and brittle; fracture irregular; light bluish grey.

(*336*) *J. S. Chamberlain's farm*, Horton township; Brandy Camp creek, one and one half miles south from Brandy Camp P. O. "*K limestone.*" *Freeport Lower limestone.*

Rather fine grained and brittle, with conchoidal fracture; light bluish grey.

(*337*) *J. C. McAllister's farm*, Horton township; Brandy Camp P. O. "K limestone of Horton township." *Freeport Lower limestone.*

Rather fine grained and brittle; fracture, sub-conchoidal; color, pearl grey.

(*338*) *T. Fox's farm*, Horton township; Mead run, three fourths mile north from Brockport. "K limestone." *Freeport Lower limestone.*

Fine grained and brittle; fracture, sub-conchoidal; bluish grey.

| | *Elk County.* (*339*) *Winslow.* | (*340*) *Chamberlain.* | (*341*) *Brandy Camp.* |
|---|---|---|---|
| Carbonate of lime, | 86.910 | 86.214 | 91.785 |
| Carbonate of magnesia, | 6.659 | 1.785 | 1.808 |
| Oxide of iron and alumina, | 2.205 | 2.610 | 1.710 |
| Phosphorus, | .017 | .050 | .032 |
| Silicious matter, | 2.390 | 7.370 | 3.370 |

(*339*) *G. W. Winslow's farm*, two miles north east from Benezette. *Ferriferous limestone.* Ten feet thick.

Rather coarse grained; brittle; mottled with calcite and more or less stained with ferric oxide. Color, generally pearl grey.

(*340*) *One mile east from J. S. Chamberlain's farm*, from branch of Toby creek, Fox township. *Ferriferous limestone.*

Very fine grained and brittle; fracture, sub-conchoidal; dark bluish grey.

(*341*) *Brandy Camp P. O.*, Horton township. *Ferriferous limestone.*

Rather coarse grained; brittle; mottled with calcite; bluish grey.

| | *Elk County.* Oyster's Quarry. (*342*) Top. | (*343*) Middle. | (*344*) Bottom. |
|---|---|---|---|
| Carbonate of lime, | 27.857 | 54.553 | 49.732 |
| Carbonate of magnesia, | .983 | 1.135 | 1.331 |
| Oxide of iron and alumina, | 3.830 | 3.030 | 3.650 |
| Phosphorus, | .062 | .104 | .238 |
| Silicious matter, | 61.670 | 38.950 | 41.690 |

(*342*) *From Oyster's quarry*, Brockport, Horton township. *Ferriferous limestone.* 7′, more or less, thick. *Top stratum.*

Appearance shaly; fossiliferous; comparatively soft; bluish black.

(*343*) *From Oyster's quarry*, Brockport, Horton township. *Ferriferous limestone.* 7′, more or less, thick. *Middle stratum.*

Fine-grained; brittle; argillaceous; dark blue.

(*344*) *From Oyster's quarry*, Brockport, Horton township. *Ferriferous limestone.* 7′, more or less, thick. *Bottom stratum.*

Appearance shaly; fossiliferous; bluish black.

| | *Elk County.* (*345*) Kane, Upper bed. | (*346*) Kane, Lower Bed. | (*347*) McAllister. | (*348*) Kyler's Corners. |
|---|---|---|---|---|
| Carbonate of lime, | 94.357 | 94.107 | 50.357 | 85.714 |
| Carbonate of magnesia, | 1.634 | 1.369 | 2.467 | 1.171 |
| Oxide of iron and alumina, | 1.638 | 1.626 | 7.040 | 3.422 |
| Phosphorus, | .031 | .063 | .054 | .069 |
| Silicious matter, | 1.630 | 2.200 | 36.860 | 8.390 |

(*345*) *Gen. Kane's quarry*, Jones township; Johnson run coal basin; four miles north east from Wilcox. *Ferriferous limestone. Upper bed.*

Fine-grained and very brittle; more or less stained with iron oxide; reddish grey.

(*346*) *Gen. Kane's quarry*, Jones township; Johnson run coal basin; four miles north east from Wilcox. *Ferriferous limestone. Lower bed.*

Rather fine-grained; brittle; somewhat mottled with calcite; dark-bluish grey.

(*347*) *J. C. McAllister's farm*, Horton township; Brandy Camp P. O. *Johnstown Cement bed.*

Appearance sandy; rather coarse-grained; very hard and tough; light-bluish grey.

(*348*) *At Kyler's Corners*, Fox township; on east side of Little Toby creek; *Clermont limestone.*

Very fine-grained; brittle; fracture conchoidal; color, bluish grey.

*Elk County.*

| | *Caledonia road.* | |
|---|---|---|
| | (*349*) *Benezette, Upper.* | (*350*) *Benezette, Middle.* |
| Carbonate of lime, | 36.785 | 76.143 |
| Carbonate of magnesia, | 1.408 | 1.740 |
| Oxide of iron and alumina, | 10.070 | 3.680 |
| Silicious matter, | 50.670 | 15.980 |

(*349*) *On Caledonia road*, one mile west from Benezette. *Benezette Upper limestone.* (Pocono). 7′ thick.

Appearance very sandy and coarse-grained; fossiliferous; light-bluish grey generally.

(*350*) *On Caledonia road*, one mile west from Benezette. *Benezette Middle limestone.* (Pocono). 7′ thick.

Appearance rather shaly; very brittle; fossiliferous; dark-bluish grey.

*Clinton County.*

| | (*351*) *Wilsham.* |
|---|---|
| Carbonate of lime, | 95.071 |
| Carbonate of magnesia, | 1.044 |
| Carbonate of iron, | .261 |
| Carbonate of manganese, | trace. |
| Sulphate of lime, | .744 |
| Phosphate of lime, | trace. |
| Water and organic matter, | .220 |
| Silicic acid, | 2.660 |
| | 100.000 |

(*351*) *Joseph Wilsham's property*, Nippenose Valley, near Rauch's Gap. *Limestone of II.* So-called plaster. See GG, pp. 80 and 81.

*Lycoming County.*

| | (*352*) *Wilson place.* | (*353*) *Ferguson.* | (*354*) *Bailey.* |
|---|---|---|---|
| Carbonate of lime, | 70.589 | 60.964 | 72.156 |
| Carbonate of magnesia, | 1.740 | 30.691 | 20.304 |
| Oxide of iron and alumina, | 4.660 | 1.330 | 1.600 |
| Sulphur, | .027 | .100 | .167 |
| Phosphorus, | trace. | .003 | .005 |
| Silicious matter, | 21.680 | 6.960 | 5.570 |

(*352*) *From Wilson place*, Porter twp., one half mile north from Jersey Shore. *Limestone of VI.*

Fine-grained; bluish grey; comparatively soft; argillaceous.

(*353*) *Ferguson's quarry*, Porter twp., one mile above mouth of Pine creek, and two miles west from Jersey Shore. *Limestone of VI.*

Very compact and fine-grained; light bluish grey; mottled with calcite; hard and brittle.

(*354*) *Bailey's quarry*, Porter twp., near mouth of Pine creek; two miles west from Jersey Shore. *Limestone of VI.*

Fine-grained; light bluish grey; hard and somewhat brittle; with conchoidal fracture.

*Wayne County.*

| | (*355*) *Cherry Ridge twp.* | (*356*) *Cherry Ridge twp.* | (*357*) *Oregon twp.* | (*358*) *Oregon twp.* |
|---|---|---|---|---|
| Carbonate of lime, | 64.392 | 19.785 | 17.696 | 11.196 |
| Carbonate of magnesia, | 1.816 | 3.518 | 1.589 | 1.664 |
| Oxide of iron and alumina, | 4.145 | 8.903 | 4.432 | 4.988 |
| Phosphorus, | .050 | .095 | .034 | .036 |
| Silicious matter, | 28.800 | 65.470 | 75.220 | 80.950 |

(*355*) *Cherry Ridge twp. Catskill limestone.*

Coarse-grained; brecciated; reddish grey.

(*356*) *Cherry Ridge twp. Catskill limestone.*

Coarse-grained; brecciated; greenish grey; sandy; slightly stained with malachite.

(*357*) *Oregon twp. Catskill limestone.*

Coarse-grained; bluish to greenish grey; with very silicious appearance.

(*358*) *Oregon twp. Catskill limestone.*

Coarse-grained; sandy; greenish grey.

## CHAPTER IV.

### Fire-Clays.

For a description of the different fire-clay beds and tests of fire-bricks, see Chapter IV of Report MM, pp. 257 to 279.

*Elk County.*

| | (*359*) *Barr & Radcliffe.* | (*360*) *Dennison.* |
|---|---|---|
| Silica, | 44.960 | 67.570 |
| Alumina, (by difference,) | 38.172 | 21.042 |
| Protoxide of iron, | .513 | .621 |
| Titanic acid, | 1.240 | .930 |
| Lime, | .120 | .100 |
| Magnesia, | .084 | .147 |
| Alkalies, | .071 | traces. |
| Water, | 14.840 | 9.590 |

(*359*) *Barr & Radcliffe mine*, two miles south west from Benezette, Benezette twp.

Rather hard and brittle; fracture conchoidal; color, pearl grey.

(*360*) *V. Dennison's farm*, Jay twp.

Hard and brittle; irregular fracture; color, pearl grey. (J. M. S.)

*Elk County.*

| | *Glen Mayo Colliery.* | |
|---|---|---|
| | (*361*) *8' over coal bed.* | (*362*) *Average of bed.* |
| Silica, | 51.720 | 56.270 |
| Alumina, (by difference,) | 21.736 | 23.225 |
| Protoxide of iron,* | 7.875 | 5.400 |
| Titanic acid, | .870 | 1.190 |
| Lime, | .060 | .010 |
| Magnesia, | 2.378 | 2.086 |
| Alkalies, | 4.581 | 4.039 |
| Water, carbonic acid, and organic matter, | 10.780 | 7.780 |
| | 100.000 | 100.000 |

* Partly as carbonate of the protoxide of iron.

(*361*) *Glen Mayo colliery*, Ridgway township. *3′ over coal bed.*

Comparatively soft and brittle; fracture irregular; generally bluish black; portions of sample dark-pearl grey. (J. M. S.)

(*362*) *Glen Mayo colliery*, Ridgway township. *Average of bed.*

Comparatively soft and brittle; fracture irregular; color, generally dark-pearl grey.

*Jefferson County.*

| | (*363*) *Brown, Erskine & Co.* |
|---|---|
| Silica, | 44.220 |
| Alumina, (by difference,) | 38.151 |
| Protoxide of iron, | .510 |
| Titanic acid, | 2.150 |
| Lime, | .020 |
| Magnesia, | .234 |
| Alkalies, | .035 |
| Water, | 14.680 |
| | 100.000 |

(*363*) *Brown, Erskine & Co.*, Bellport Mills. *Fire-clay in Pottsville Conglomerate.*

Fine-grained; brittle; fracture irregular, slightly conchoidal; color, pearl grey.

*Clarion County.*

| | (*364*) *McCauley.* | (*365*) *Sligo Fire Brick Works.* |
|---|---|---|
| Silica, | 44.610 | 56.630 |
| Alumina, | 88.010 | 28.850 |
| Protoxide of iron, | 1.251 | 1.260 |
| Titanic acid, | 1.020 | .990 |
| Lime, | .080 | .260 |
| Magnesia, | .407 | .079 |
| Alkalies, | 1.735 | .694 |
| Water and organic matter, | 13.630 | 11.850 |
| | 100.743 | 100.613 |

(*364*) *J. McCauley*, three miles west from New Bethlehem, in Anthony's bend of Red Branch creek. *Fire-clay in Pottsville Conglomerate.*

Hard, brittle, dark grey; rather coarse-grained.

(*365*) *Sligo Fire Brick Works*, Sligo, Piney township. Brittle, pearl grey.

*Armstrong County.*

| | (*366*) *Brown, Neale & Orr.* | (*367*) *Stewart.* |
|---|---|---|
| Silica, | 50.370 | 55.960 |
| Alumina, | 32.890 | 28.415 |
| Protoxide of iron, | 1.641 | 1.641 |
| Titanic acid, | 1.030 | 1.010 |
| Lime, | .310 | .070 |
| Magnesia, | .353 | .396 |
| Alkalies, | .290 | .615 |
| Water and organic matter, | 13.760 | 12.690 |
| | 100.644 | 100.797 |

(*366*) *Brown, Neale & Orr*, in the ravine of Organ's run, two and one half miles north west from Kittanning. *Kittanning fire-clay.*

Comparatively soft; brittle; more or less stained with organic matter; color generally pearl grey.

(*367*) *D. Stewart*, at Kittanning. *Kittanning Lower fire-clay.*

Hard, brittle, brownish grey with conchoidal fracture.

*Armstrong County.*

| | (*368*) *Reynolds.* |
|---|---|
| Silica, | 58.750 |
| Alumina, | 25.170 |
| Protoxide of iron, | 2.195 |
| Protoxide of manganese, | trace. |
| Titanic acid, | 1.050 |
| Lime, | .710 |
| Magnesia, | .936 |
| Alkalies, | 3.535 |
| Water, | 8.110 |
| | 100.456 |

(*368*) *Ross Reynolds*, nearly one mile north east from Kittanning. *Fire-clay under Clarion coal.*

Soft and brittle; unctuous; pearl grey.

## CHAPTER V.

### Miscellaneous Analyses.

In this chapter are included the analyses of pig irons, iron ores, coals, limestones, shales and slags which have not been otherwise classified.

### *Pig Iron.*

*Armstrong County.*

| | (*369*) *Mahoning.* | (*370*) *Stewardson.* | (*371*) *Stewardson.* | (*372*) *Pine Creek.* |
|---|---|---|---|---|
| Silicium, | 1.872 | 3.407 | 2.873 | 3.195 |
| Sulphur, | .072 | .038 | .038 | .043 |
| Phosphorus, | .855 | .912 | .852 | 1.035 |
| Manganese, | 1.585 | 2.139 | 2.068 | 2.306 |

(*369*) *Mahoning furnace.* J. A. Colwell. No. 1 open grey iron.

(*370*) *Stewardson furnace*, one mile east from mouth of Mahoning creek. F. B. & A. Laughlin. No. 1 open grey iron.

(*371*) *Stewardson furnace*, one mile east from mouth of Mahoning creek. F. B. & A. Laughlin. Open-grained No. 1 iron.

(*372*) *Pine Creek furnace*, six miles north east from Kittanning. No. 1 open grey iron.

### *Pig Iron.*

*Lycoming County.*

| | (*373*) *Safe Harbor furnace.* |
|---|---|
| Silicium, | 1.311 |
| Sulphur, | .024 |
| Phosphorus, | 1.458 |
| Manganese, | .202 |

(*373*) *Safe Harbor furnace*, Lycoming county. Old iron bolt made at this furnace and mill.

## *Iron Ore.*

*Monroe County.*

| | (374) *Rossland Mining Company.* |
|---|---|
| Sesquioxide of iron, | 38.142 |
| Sesquioxide of manganese, | .910 |
| Sesquioxide of cobalt, | .010 |
| Alumina, | 4.454 |
| Lime, | .610 |
| Magnesia, | .828 |
| Sulphuric acid, | .047 |
| Phosphoric acid, | .304 |
| Water and organic matter, | 9.440 |
| Silicious matter, | 45.060 |
| | 99.805 |
| Metallic iron, | 26.700 |
| Metallic manganese, | .634 |
| Sulphur, | .019 |
| Phosphorus, | .133 |
| Phosphorus in 100 parts iron, | .498 |

(*374*) *Rossland Mining Company's* Rossland mine, Ross twp., two and one half miles north of the Blue mountain. R. M. Jones, Bangor, Northampton county. Sample (124 pieces) selected by Mr. H. M. Chance.

## *Fossil Ore of V.*

*Montour County.*

| | (375) *Liberty mines.* |
|---|---|
| Sesquioxide of iron, | 62.142 |
| Sesquioxide of manganese, | .030 |
| Alumina, | 7.284 |
| Lime, | .450 |
| Magnesia, | .230 |
| Sulphuric acid, | .027 |
| Phosphoric acid, | .224 |
| Water and organic matter, | 4.791 |
| Silicious matter, | 24.670 |
| | 99.848 |
| Metallic iron, | 43.500 |
| Metallic manganese, | .021 |
| Sulphur, | .011 |
| Phosphorus, | .098 |
| Phosphorus in 100 parts iron, | .225 |

(*375*) *Liberty mines*, near Mooresburg, Liberty twp. Sample from mines located on north dip of Montour ridge, in Montour county, one mile from the Catawissa branch of the P. & R. R. R. Sample is a cross section of the soft

fossil vein, so cut as to give an average of the vein. Mines owned and operated by Mr. R. M. Cummings. *Fossil ore of V.*

## *Magnetic Iron Ore.*

*Lebanon County.*

| | (*376*) *Cornwall.* |
|---|---|
| Bisulphide of iron, | .722 |
| Magnetic oxide of iron, | 61.625 |
| Ferric oxide, | 11.840 |
| Manganic-oxide, | .195 |
| Cobaltic oxide, | .030 |
| Oxide of copper, | .040 |
| Alumina, | 1.936 |
| Lime, | 1.830 |
| Magnesia, | 4.544 |
| Sulphuric acid, | 1.145 |
| Phosphoric acid, | .023 |
| Water, | 4.380 |
| Silica, | 11.330 |
| | 99.640 |
| Metallic iron, | 53.250 |
| Metallic manganese, | .136 |
| Sulphur, | .843 |
| Phosphorus, | .010 |
| Phosphorus in 100 parts iron, | .018 |

(*376*) *Cornwall iron ore mines*, Lebanon county. Magnetic iron ore used as a "fix" in the puddling furnaces at Paxton Rolling-mill, Harrisburg.

*Adams County.*

| | (*377*) *Magnetic sand.* |
|---|---|
| Protoxide of iron, | 5 785 |
| Sesquioxide of iron, | 22.428 |
| Protoxide of manganese, | .340 |
| Sesquioxide of chromium, | trace. |
| Alumina, | 8.923 |
| Titanic acid, | 7.370 |
| Lime, | 3.040 |
| Magnesia, | 1.812 |
| Water, | 4.988 |
| Silica, | 42.130 |
| Alkalies and undetermined, | 3.184 |
| | 100.000 |
| Metallic iron, | 20.200 |

(*377*) *Magnetic sand*, from Fairfield and Gettysburg road, two miles east from Fairfield, Adams county.

## *Micaceous Hematite.*

*York County.*

| | (*378*) *Dare* |
|---|---|
| Metallic iron, | 61.950 |
| Sulphur, | .020 |
| Phosphorus, | .010 |
| Silicious matter, | 9.910 |
| Phosphorus in 100 parts iron, | .016 |

(*378*) *From the estate of Judge Dare*, one mile from Bowmandale, Monaghan township, York county, on bank of Yellow Breeches creek.

A foliated, micaceous hematite, carrying a small quantity of quartz sand. (J. M. S.)

## *Brown Hematite.*

| | *Blair County.* (*379*) *Patterson.* | *Franklin County.* (*380*) *McConnell tract.* |
|---|---|---|
| Sesquioxide of iron, | 77.780 | 62.285 |
| Sesquioxide of manganese, | trace. | 1.769 |
| Sesquioxide of cobalt, | .370 | — |
| Alumina, | .850 | 1.553 |
| Lime, | .830 | .360 |
| Magnesia, | .472 | .212 |
| Sulphuric acid, | .022 | .085 |
| Phosphoric acid, | .483 | .302 |
| Water, | 11.770 | 10.784 |
| Silicious matter, | 7.340 | 22.290 |
| | 99.917 | 99.640 |
| Metallic iron, | 54.450 | 43.600 |
| Metallic manganese, | trace. | 1.232 |
| Sulphur, | .009 | .034 |
| Phosphorus, | .211 | .132 |
| Phosphorus in 100 parts iron, | .387 | .303 |

(*379*) *Patterson mine*, one mile south from Williamsburg, Blair county. *Brown hematite of II.* Sample brought to Laboratory by Mr. J. D. Patterson, Resident Clerk House of Representatives, 1880–81. (J. M. Stinson.)

(*380*) *McConnell tract*, about four miles west from Mer-

cersburg, Franklin county, Pa. *Brown hematite of II.* Sample sent to Laboratory by Mr. Thomas B. Kennedy, president of the C. V. R.R Company.

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The following analyses (381 to 403) were made of specimens sent in to the Laboratory by Mr. John F. Carll, and their discussion will be in place in his Report on the Oil Regions.

*Allegheny County.*

| | (381) | (382) | (383) | (384) |
|---|---|---|---|---|
| | *Boyd's Hill gas well.* | | | |
| Carbonate of iron, | 21.750 | 16.571 | 10.771 | 8.596 |
| Carbonate of lime, | 6.892 | 2.678 | .942 | .482 |
| Carbonate of magnesia, | 2.194 | 1.875 | 1.413 | 1.831 |
| Alumina, | 9.670 | 9.651 | 5.152 | 6.050 |
| Silicious matter, | 54.360 | 63.270 | 77.340 | 78.500 |
| Iron, | 10.500 | 8.000 | 5.200 | 4.150 |
| Lime, | 3.680 | 1.500 | .530 | .270 |
| Magnesia, | 1.045 | .893 | .673 | .872 |

(*381*) *Boyd's Hill gas well*, at Pittsburgh. Specimens taken from a depth of 94′to 305′. *Lower Barren measures.*

Specimens in small lumps ; of a dark grey to bluish grey color ; general appearance shaly ; contain small pieces of carbonate of iron ore.

(*382*) *Boyd's Hill gas well*, at Pittsburgh. Specimens taken at depth of 350′ to 482′. *Freeport group.*

Dark bluish grey ; lumps of fire-clay prominent ; show small pieces of carbonate ore.

(*383*) *Boyd's Hill gas well*, at Pittsburgh. Specimens taken at depth of 587′ to 612′. *Kittanning group.*

Reddish grey to bluish grey ; general appearance sandy ; show considerable white sand, with fine particles of carbonate of iron ore.

(*384*) *Boyd's Hill gas well*, at Pittsburgh. Specimens taken at depth of 642′ to 657′.

Dark bluish grey ; appearance sandy ; also shaly ; small specks of mica numerous ; a few small particles of carbonate ore.

*Allegheny County.*

| | (385) | (386) | (387) |
|---|---|---|---|
| | *Boyd's Hill gas well.* | | |
| Carbonate of lime, | 64.535 | 38.071 | 59.268 |
| Carbonate of magnesia, | 2.177 | 1.474 | 1.421 |
| Oxide of iron and alumina, | 6.270 | 3.200 | 3.710 |
| Silicious matter, | 23.510 | 55.720 | 33.970 |

(*385*) *Boyd's Hill gas well*, at Pittsburgh. Specimens taken at depth of 879′ to 889′. *Umbral* (*?*)

Dark bluish grey coarse powder; small pieces of shale visible.

(*386*) *Boyd's Hill gas well*, at Pittsburgh. Specimens taken at depth of 889′ to 914′. *Umbral* (*?*)

Light bluish grey, inclining to greenish grey; show considerable fine white sand.

(*387*) *Boyd's Hill gas well*, at Pittsburgh. Specimens taken at depth of 889′ to 914′. *Umbral* (*?*); being No. (*386*) washed and sifted.

Light bluish grey and greenish grey; not so sandy as No. (*386*).

*Beaver County.*

| | (388) | (389) | (390) |
|---|---|---|---|
| | *Economy Well No. 2.* | | |
| Carbonate of iron, | 29.000 | 8.492 | 5.593 |
| Carbonate of lime, | 10.732 | 1.125 | 4.393 |
| Carbonate of magnesia, | 10.821 | 2.572 | 2.534 |
| Alumina, | 3.500 | 4.953 | 3.923 |
| Silicious matter, | 44.660 | 82.120 | 82.740 |
| Iron, | 14.000 | 4.100 | 2.700 |
| Lime, | 6.010 | .630 | 2.460 |
| Magnesia, | 5.153 | 1.225 | 1.207 |

(*388*) *Economy well No. 2*, at Beaver Falls, Beaver county. Drillings from the *approximate horizon of the Sharon coal bed.* From depth of 250′ to 274′.

Dark bluish grey; small scales of mica abundant; has the general appearance of a silicious carbonate ore.

(*389*) *Economy well No. 2*, at Beaver Falls. Specimens taken at a depth of 430′ to 470′; *from approximate horizon of the Sharpsville sandstone.*

Light grey generally, with plates of bluish black shale;

appearance sandy ; scales of mica abundant ; small particles of carbonate ore.

(*390*) *Economy well No. 2*, at Beaver Falls. Specimens taken at depth of 1940′ to 1950′. *Berea grit (?)*

Light grey and dark grey ; general appearance sandy ; numerous small scales of mica.

*Venango County.*

| | (*391*) Near McClintockville. | (*392*) Near President. | (*393*) Near Franklin. |
|---|---|---|---|
| Carbonate of lime, | 29 643 | 31.964 | 37.964 |
| Carbonate of magnesia, | .438 | .658 | 1.188 |
| Oxide of iron and alumina, | 1.950 | 2.200 | 3.880 |
| Silicious matter, | 66.260 | 63.280 | 55.110 |

(*391*) *Venango county, one half mile from McClintockville, at base of Pithole grit.* 0′ to 2′ thick.

Appearance, sandy ; rather fine grained ; hard and tough ; luster, vitreous, somewhat pearly ; color, light bluish grey.

(*392*) *Venango county, one half mile from President, at base of Pithole grit.* 0″ to 6″ thick.

Appearance sandy ; hard and tough : rather fine grained ; luster vitreous, slightly pearly ; color, dark bluish grey.

(*393*) *Venango county, one half mile south from Franklin. About 20 feet below Shenango sandstone.* 0″ to 18″ thick.

Conglomerate of quartz pebbles and silicious limestone. Color, generally bluish grey. Portion freest from pebbles selected for analysis.

*Venango County.*

| | (*394*) Near Fosters. |
|---|---|
| Carbonate of iron, | 48.160=23.25 per cent iron. |
| Carbonate of lime, | 6.696 |
| Carbonate of magnesia, | 7.204 partly as silicate (mica.) |
| Alumina, | 3.147 |
| Phosphorus, | .505 |
| Silicious matter, | 31.980 |

(*394*) *Venango county, one half mile east from Fosters. Below Shenango Sandstone.*

Nodules of carbonate of iron ore ; with a greyish sand-

rock containing numerous quartz pebbles and small nodules of carbonate ore.

The carbonate ore, containing numerous fossil casts, is rather fine-grained and of a dark-brownish grey color; it shows considerable mica in thin scales; also a few specks of pyrites; and is irreglarly seamed with calc-spar.

*Mercer County.*

| | (*395*) *Snodgrass Quarry.* | (*396*) *Gibson Run.* |
|---|---|---|
| Carbonate of lime, | 30.893 | 27.535 |
| Carbonate of magnesia, | 2.444 | 3.405 |
| Carbonate of iron, | 11.011 | 16.708 |
| Alumina, | 1.996 | 1.977 |
| Silicious matter, | 52.650 | 49.540 |
| Metallic iron, | 5.316 | 8.066 |

(*395*) *At base of Snodgrass flag quarry*, one half mile east from Jamestown, Mercer county. 6″ to 12″ thick. Appearance sandy; rather fine-grained; hard and tough; scales of mica numerous; luster vitreous, somewhat pearly. Color, bluish grey.

(*396*) *Gibson run*, just above Gibson well, Jamestown borough. Near top of exposed flags, 2′ to 3′ thick.

Same general appearance as No. (*395*).

*Allegheny County.*

| | (*397*) *Deposit on tubing.* | (*398*) *Deposit along ditch.* |
|---|---|---|
| Carbonate of lime, | 89.535 | 53.910 |
| Carbonate of magnesia, | 1.876 | 11.351 |
| Carbonate of baryta, | 4.679 | 8.884 |
| Oxide of iron and alumina, | 2.090 | 3.640 |
| Silicious matter, | .820 | 19.160 |

(*397*) *Deposit on tubing from the water*, at Tarentum well, Allegheny county.

The deposit is very thin; has a somewhat coarse fibrous structure and greyish white color.

(*398*) *Deposit along ditch leading from Tarentum well*, Allegheny county.

The deposit consists of a thin, nodular, shelly material filled with a light brown clay. The shell after being tolerably well cleaned from the clay was analyzed.

*Warren County.*

| | (*399*) *Deposit on well tubing on Clapp farm.* | (*400*) |
|---|---|---|
| Carbonate of lime, | 94.253 | 95.893 |
| Carbonate of magnesia, | 1.331 | 1.165 |
| Carbonate of baryta, | .626 | .693 |
| Oxide of iron and alumina, | 1.090 | .860 |
| Silicious matter, | 1.610 | .030 |

(*399*) *Deposit on the outside of tubing in well on Clapp farm*, three miles south west from Tidioute, Warren county.

Deposit thin and of a greyish-white color generally. Structure for the most part granular; at places fibrous. Emits a strong petroleum odor when being ground up.

(*400*) *Deposit on tubing in well on Clapp farm*, three miles south west from Tidioute, Warren county.

Deposit $\frac{1}{2}''$ to $\frac{3}{4}''$ thick; yellowish white in color and generally fibrous in structure. It emits a strong odor of petroleum when being ground up.

*Venango County.*

| | (*401*) *Deposit in working barrel.* |
|---|---|
| Sulphate of baryta, | 94.74 |
| Sulphate of lime, | .85 |
| Sulphate of magnesia, | trace. |
| Oxide of iron, | .17 |
| Water and organic matter, | 2.13 |
| Silica, | 2.09 |
| | 99.98 |

(*401*) *Deposit from inside of working barrel* from well on Oil creek, Venango county (?).

Deposit thin; greyish white, with a somewhat concentric structure.

| | *Warren, Penna.* (*402*) *Asylum quarry rock.* | *Panama, N Y.* (*403*) *Panama rock.* |
|---|---|---|
| Carbonate of lime, | 98.035 | 98.500 |
| Carbonate of magnesia, | 1.793 | .983 |
| Carbonate of baryta, | none. | none. |
| Oxide of iron, | .020 | .040 |
| Silicious matter, | .010 | .340 |

(*402*) *Deposit in vertical crevices of Asylum quarry rock*, at Warren, Pa.

Color pure white to yellowish white; structure fibrous generally; at places granular.

(*403*) *Deposit in vertical crevices of Panama rock*, at Panama, N. Y.

Consists of an almost pure white fibrous material with cavities filled with a yellowish white quartz sand. Separated from sandy portion and analyzed.

*Franklin County.*

| | (*404*) *David Shook.* |
|---|---|
| Carbonate of lime, | 96.250 |
| Carbonate of magnesia, | .556 |
| Oxide of iron and alumina, | .620 |
| Phosphorus, | .026 |
| Water and organic matter, | 1.360 |
| Silica, | 1.210 |
| | 100.022 |

(*404*) *Mr. David Shook's farm*, Greencastle, Franklin county. *Marl.*

Sample sent to Laboratory by Rev. W. V. Ganoe. (J. M. S.)

*Crawford County.*

| | (*405*) *Clay from gravel pit well.* |
|---|---|
| Silica, | 51.010 |
| Alumina, | 20.930 |
| Protoxide of iron, | 6.831 |
| Titanic acid, | 1.090 |
| Lime, | 3.010 |
| Magnesia, | 2.511 |
| Carbonic acid, | 5.779 |
| Alkalies, | 4.372 |
| Water, | 3.840 |
| | 99.373 |

(*405*) *Clay from a gravel pit well* near Titusville, Crawford county. (J. M. S.)

*Wayne County.*

| | (*406*) *Catskill Red shale.* |
|---|---|
| Silica, | 59.260 |
| Alumina, (by difference,) | 19.877 |
| Sesquioxide of iron, | 10.071 |
| Lime, | .250 |
| Magnesia, | 1.917 |

| | |
|---|---|
| Sulphuric acid, | .012 |
| Phosphoric acid, | .158 |
| Alkalies, | 4.855 |
| Water, | 3.600 |
| | 100.000 |
| Metallic iron, | 7.050 |
| Sulphur, | .005 |
| Phosphorus, | .069 |

(*406*) *Catskill Red shale*, Texas twp., Wayne county. (J. M. S.)

*Armstrong County.*

| | (*407*) *Slag from Stewardson furnace.* |
|---|---|
| Silica, | 31.800 |
| Alumina, | 12.580 |
| Protoxide of iron, | .630 |
| Protoxide of manganese, | .994 |
| Lime, | 48.663 |
| Sulphide of calcium, | 3.105 |
| Magnesia, | 2.101 |
| | 99.873 |
| Sulphur, | 1.378 |

(*407*) *Slag made at Stewardson furnace*, Armstrong county, on March 2, 1880.

*Bradford County.—Coals.*

Samples of coal from the same part of the Barclay bed intended to test by their analyses the effect of exposure to the atmosphere by drainage of the water in mining.

Samples were selected by Mr. F. F. Lyon, Engineer of the Barclay mines, and forwarded to the Laboratory by Mr. James Macfarlane.

| | (*408*) | (*409*) | (*410*) |
|---|---|---|---|
| Water @ 225°, | .965 | 1.145 | 1.365 |
| Volatile matter, | 17.430 | 16.915 | 16.395 |
| Fixed carbon, | 69.246 | 73.672 | 71.877 |
| Sulphur, | .709 | .603 | .523 |
| Ash, | 11.650 | 7.665 | 9.840 |
| | 100.000 | 100.00 | 100.000 |
| Color of ash, | grey. | grey. | grey. |
| Coke, per cent., | 81.605 | 81.940 | 82.240 |
| Fuel ratio, | 1 : 3.97 | 1 : 4.36 | 1 : 4.32 |
| Character of coke, | fair. | inferior. | inferior. |

(*408*) *From the drift east from the store*, near the mouth of the drift opened in 1859.

Coke fairly coherent, slightly puffed.

(*409*) *From the Old Gatiss opening;* from a pillar exposed to the atmosphere about 10 years, near the drift mouth. But as this is a very old opening, its water must have been drained off about 25 or 30 years.

Coke inferior, powdery.

(*410*) *From mouth of Gatiss opening;* outcrop exposed to the light as well as to the atmosphere about 30 years.

Coke slightly coherent; powdery. Coal seems to alter its shape but little during coking.

| | (*411*) | (*412*) | (*413*) |
|---|---|---|---|
| Water @ 225°, | 1.025 | 1.595 | 1.240 |
| Volatile matter, | 17.375 | 16.315 | 17.725 |
| Fixed carbon, | 71.972 | 71.895 | 72.633 |
| Sulphur, | .633 | .575 | .537 |
| Ash, | 8.995 | 9.620 | 7.865 |
| | 100.000 | 100.000 | 100.000 |
| Color of ash, | grey. | cream. | grey. |
| Coke, per cent., | 81.600 | 82.090 | 81.035 |
| Fuel ratio, | 1 : 4.14 | 1 : 4.34 | 1 : 4.09 |
| Character of coke, | fair. | worthless. | inferior. |

(*411*) *Fresh mined coal taken from where it has always been under water.*

Coke coherent, firm; quality fair.

(*412*) *Pillar coal from inside of drift* No. 2, exposed to the atmosphere 14 years.

Coke, inferior, powdery.

(*413*) *From a piece of coal that has lain in front of the office at Barclay for nine years* exposed to the weather.

Coke, inferior, powdery.

*Bradford County.—Coke.*

| | (*414*) |
|---|---|
| Fixed carbon, | 85.517 |
| Sulphur, | 1.505 |
| Ash, | 12.978 |
| | 100.000 |
| Color of ash, | pinkish grey. |
| Phosphorus, | .0076 |

(*414*) Coke made in Laboratory from coal from the Long Valley Coal Company's openings, two miles northeast from Barclay.

# INDEX TO REPORT M³.

## A.—Alphabetical Index of Owner's Names, &c.


| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| Addleman, Wm. B., | 127, | Huntingdon, | Brown hematite of II, | 40 |
| Addleman, Wm. B., | 135, | Centre, | Brown hematite of II, | 43 |
| Ahl, | 43, | Franklin, | Brown hematite of II, | 13 |
| Asylum quarry, | 402, | Warren, | Miscellaneous, | 107 |
| Attick's bank, | 84, | York, | Brown hematite of II, | 25 |
| Awl (P.) & Bro., | 132, | Fulton, | Brown hematite of VIII, | 42 |
| Baché, J. W., | 256, | Lycoming, | Coal, | 74 |
| Bailey's quarry, | 354, | Lycoming, | Limestone of VI, | 94 |
| Bannan mine, | 255, | Lycoming, | Coal, bed D, | 74 |
| Barclay coal basin, | 408 to 413, | Bradford, | Coal, | 109,110 |
| Barger quarry, | 316, | Clarion, | Ferriferous limestone, | 87 |
| Barnitz, | 99, | Perry, | Brown hematite of VIII, | 31 |
| Barr & Radcliffe, | 359, | Elk, | Fire-clay, | 95 |
| Basom, Christian, | 120, | Perry, | Red hematite of IX, | 37 |
| Battin, M. E., | 285, | Franklin, | Limestone of II, | 82 |
| Beaver bank, | 4, | Franklin, | Brown hematite of II, | 1 |
| Beer's estate, | 173, | Armstrong, | Freeport Upper coal, | 56 |
| Bell mine, | 86, | York, | Magnetite, | 26 |
| Beltzhoover bank, | 78,78a, | Cumberland, | Brown hematite of II, | 23 |
| Bender, C. H., | 83, | York, | Brown hematite of II, | 25 |
| Big Pond bank, | 59, | Cumberland, | Brown hematite of II, | 17 |
| Blose, Geo., | 214,215, | Jefferson, | Freeport Lower coal, | 64 |
| Boyd's Hill gas well, | 381 to 387, | Allegheny, | Miscellaneous, | 103,104 |
| Bovaird, C., | 329, | Jefferson, | Ferriferous limestone, | 89 |
| Bower's furnace bank, | 1, | Franklin, | Brown hematite of VIII, | 1 |
| Brady's Bend Iron Co., | 158, | Armstrong, | Buhrstone ore, | 51 |
| Brandy Camp, | 341, | Elk, | Ferriferous limestone, | 91 |
| Bridges, John, | 54, | Cumberland, | Brown hematite of II, | 16 |
| Brooks mine, | 179, | Armstrong, | Kittanning Upper coal, | 58 |
| Brown, Geo., | 222, | Elk, | Clarion coal, | 66 |
| Brown, Erskine & Co., | 363, | Jefferson, | Fire-clay, | 96 |
| Brown, Neale & Orr, | 366, | Armstrong, | Fire-clay, | 97 |
| Brown, Neale & Orr, | 160, | Armstrong, | Carbonate ore, | 52 |
| Butler opening, | 249, | Lycoming, | Coal, bed E, | 72 |
| Butterfield, Owen, | 149, | Jefferson, | Brown hematite, C. M., | 47 |
| Caledonia road, | 349,350, | Elk, | Benezette Limestone, | 93 |
| Calico bank, | 55, 56, | Cumberland, | Brown hematite of II, | 16 |
| Calliman, Thomas, | 28, | Franklin, | Brown hematite of II, | 8 |
| Campbell & Barrett, | 154, | Armstrong, | Buhrstone ore, | 49 |
| Carrick furnace bank, | 6,6a, | Franklin, | Brown hematite of II, | 2 |

| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| Carter opening, | 247, | Lycoming, | Coal, bed B, | 72 |
| Cartersville furnace, | 145, | Lycoming, | Carbonate ore of XI, | 46 |
| Cascade mine, | 237, | Elk, | Coal, Dagus bed, | 70 |
| Catskill, | 406, | Wayne, | Red shale, | 108 |
| Chambers, Wm. L., | 42, | Franklin, | Brown hematite of II, | 13 |
| Chamberlain, J. S., | 340, | Elk, | Ferriferous limestone, | 91 |
| Chamberlain, J. S., | 336, | Elk, | Freeport Lower limestone, | 91 |
| Cherry Ridge, | 355,356, | Wayne, | Catskill limestone, | 94 |
| Chestnut bank, | 57, | Cumberland, | Brown hematite of II, | 17 |
| Clapp farm, | 399,400, | Warren, | Miscellaneous, | 107 |
| Clarion Coal Co., | 206, | Clarion, | Kittanning Lower coal, | 63 |
| Clark, Mr., | 121, | Juniata, | Brown hematite of VIII, | 38 |
| Clever, Geo., | 52, | Cumberland, | Brown hematite of II, | 15 |
| Clever, Geo. H., | 58, | Cumberland, | Brown hematite of II, | 17 |
| Clever No. 1 bank, | 53,53a, | Cumberland, | Brown hematite of II, | 15 |
| Clippinger bank, | 51, | Cumberland, | Brown hematite of II, | 15 |
| Colwell, J. A., | 305, | Armstrong, | Ferriferous limestone, | 85 |
| Colwell, J. A., | 157, | Armstrong, | Buhrstone ore, | 51 |
| Colwell, J. A., | 369, | Armstrong, | Pig iron, | 99 |
| Colwell, J. A., | 180, | Armstrong, | Freeport Upper coal, | 58 |
| Colwell, J. A., | 181, | Armstrong, | Freeport Lower coal, | 58 |
| Cook, Philip, | 111, | Perry, | Fossil ore of VIII, | 34 |
| Coover opening, | 55, | Cumberland, | Brown hematite of II, | 16 |
| Coover & Wolf, | 82, | York, | Brown hematite of II, | 24 |
| Cornwall ore bank, | 376, | Lebanon, | Magnetite, | 101 |
| Cowan, W. B., | 219, | Jefferson, | Coal, | 65 |
| Craighead, | 279, | Cumberland, | Limestone of II, | 80 |
| Cressler, John H., | 51, | Cumberland, | Brown hematite of II, | 15 |
| Cressler, Joseph, | 45, | Franklin, | Brown hematite of II, | 13 |
| Cumbler, | 112, | Perry, | Fossil ore of VIII, | 35 |
| Dare, Judge, | 378, | York, | Micaceous hematite, | 102 |
| Davis, M., | 301, | Armstrong, | Johnstown cement, | 85 |
| Dennison, V., | 226, | Elk, | Coal, Alton bed (?), | 67 |
| Dennison, V., | 360, | Elk, | Fire-clay, | 95 |
| Diven tract, | 69, | Cumberland, | Brown hematite of II, | 20 |
| Douglas, Wyeth, | 18, | Franklin, | Brown hematite of II, | 5 |
| Dull, J. J., | 123, | Mifflin, | Fossil ore of V, | 39 |
| Dull (A. J.) & Co., | 298,299,300, | Armstrong, | Freeport Upper limestone, | 84 |
| Dull & Bradley, | 128,129, | Huntingdon, | Fossil ore of V, | 41 |
| Economy Well No. 2, | 388,389, 390, | Beaver, | Miscellaneous, | 104 |
| Ege bank, | 77,77a, | Cumberland, | Brown hematite of II, | 23 |
| Eisenhower & Gill, | 72, | Cumberland, | Brown hematite of II, | 21 |
| English mine, | 251,252,253,254, | Lycoming, | Coal, Big Bed, | 73 |
| English ore bank, | 35, | Franklin, | Brown hematite of II, | 11 |
| Enty, A., | 331, | Jefferson, | Ferriferous limestone, | 89 |
| Eshbaugh, A., | 217, | Jefferson, | Freeport Lower coal, | 65 |
| Eureka mines, | 231,232, | Elk, | Coal, Alton bed, | 68 |
| Evans Round Top, | 326, | Jefferson, | Freeport Lower limestone, | 88 |
| Ewing, H. M., | 170, | Armstrong, | Pittsburgh coal, | 56 |
| Fairfield, | 377, | Adams, | Magnetic sand, | 101 |

| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| Fairmount Coal Co., | 192, | Clarion, | Freeport Lower coal, | 60 |
| Fairmount Coal Co., | 197,198, | Clarion, | Freeport Lower coal, | 61 |
| Fairmount Coal Co., | 196, | Clarion, | Kittanning Middle coal, | 61 |
| Fairmount Coal Co., | 193,194,195, | Clarion, | Kittanning Lower coal, | 60 |
| Fairmount Coal Co., | 199, | Clarion, | Kittanning Lower coal, | 61 |
| Fairmount Coal Co., | 266,267, 268,269, | Clarion, | Coke, | 76 |
| Fairmount Coal Co., | 164, | Clarion, | Carbonate ore, | 53 |
| Fergusson's quarry, | 353, | Lycoming, | Limestone of VI, | 94 |
| Fosters, | 394, | Venango, | Miscellaneous, | 105 |
| Fox bank, | 210, | Clarion, | Kittanning Lower coal, | 63 |
| Fox farm, | 162, | Clarion, | Buhrstone ore, | 52 |
| Fox, T., | 338, | Elk, | Freeport Lower limestone, | 91 |
| Franklin, | 393, | Venango, | Miscellaneous, | 106 |
| Frost, | 333, | Jefferson, | Limestone, | 90 |
| Fuller mine, | 93,93a, | York, | Magnetite, | 28 |
| Furnace Run mines, | 144, | Lycoming, | Fossil ore of VIII, | 45 |
| Ganoga lake, | 146,147, | Sullivan, | Carbonate ore, | 47 |
| Garlic bank, | 14, | Franklin, | Brown hematite of II, | 4 |
| George, P., | 307, | Armstrong, | Ferriferous limestone, | 86 |
| George, Benj., | 26, | Franklin, | Brown hematite of II, | 8 |
| Gibson run, | 396, | Mercer, | Miscellaneous, | 106 |
| Glen Mayo colliery, | 361,362, | Elk, | Fire-clay, | 95 |
| Glen Mayo colliery, | 239, | Elk, | Coal, Alton bed, | 70 |
| Gochenauer & Rohrer, | 49, | Franklin, | Brown hematite of II, | 14 |
| Goheen's bank, | 200, | Clarion, | Freeport Upper coal, | 62 |
| Goheen's bank, | 201, | Clarion, | Freeport Lower coal, | 62 |
| Graff, | 309, | Armstrong, | Ferriferous limestone, | 86 |
| Gravel pit well, | 405, | Crawford, | Clay, | 108 |
| Gresh, E. K., | 238, | Elk, | Coal, Marshburg, | 70 |
| Grove & Co., | 60, | Cumberland, | Brown hematite of II, | 18 |
| Grove bank, | 71,71a, | Cumberland, | Brown hematite of II, | 21 |
| Guilford bank, | 37, | Franklin, | Brown hematite of II, | 11 |
| Guiterman & Robinson, | 68,68a, | Cumberland, | Brown hematite of II, | 19 |
| Hagy, John, | 188, | Armstrong, | Freeport Upper coal, | 60 |
| Hamilton, W. R., | 291, | Armstrong, | Freeport Upper limestone, | 83 |
| Hanna, Wm., | 330, | Jefferson, | Ferriferous limestone, | 89 |
| Hawbecker, S. Z., | 283,284, | Franklin, | Limestone of II, | 81 |
| Hays, Enos, | 230, | Elk, | Coal, | 68 |
| Hayes mine, | 143, | Lycoming, | Fossil ore of VIII, | 45 |
| Heck bank, | 81, | York, | Brown hematite of II, | 24 |
| Henry Clay No. 1 bank, | 68,68a, | Cumberland, | Brown hematite of II, | 19 |
| Henry Clay No. 2 bank, | 67, | Cumberland, | Brown hematite of II, | 19 |
| Henry Clay No. 3 bank, | 66, | Cumberland, | Brown hematite of II, | 19 |
| Hindman farm, | 166, | Butler, | Carbonate ore, | 54 |
| Hindman quarry, | 314, | Clarion, | Ferriferous limestone, | 87 |
| Hindman quarry, | 163, | Clarion, | Buhrstone ore, | 52 |
| Hope mine, | 38, | Franklin, | Brown hematite of II, | 12 |
| Hopkins, D., | 323, | Jefferson, | Freeport limestone, | 88 |
| Huffman, A., | 216, | Jefferson, | Coal, | 65 |
| Huffman, A., | 324, | Jefferson, | Freeport limestone, | 88 |

| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| Hyde, J. S., | 335, | Elk, | Freeport Upper limestone, | 91 |
| Iler, John, | 321,322, | Jefferson, | Freeport Upper limestone, | 88 |
| Iler, John, | 328, | Jefferson, | Johnstown cement, | 89 |
| Johnson, Ben., | 221, | Elk, | Clarion coal, | 66 |
| Jones, Jennings, | 5, | Franklin, | Brown hematite of II, | 2 |
| Kahle, Perry, | 148, | Jefferson, | Brown hematite C. M., | 47 |
| Kane, Genl., | 240, | Elk, | Coal, Hoyt bed, | 70 |
| Kane, Genl., | 345,346, | Elk, | Ferriferous limestone, | 92 |
| Kelley's quarry, | 334, | Forest, | Tionesta limestone, | 90 |
| Kelly, A. B., | 165, | Forest, | Brown hematite C. M., | 53 |
| Keslar, J., | 212, | Jefferson, | Coal, | 64 |
| Knaub bank, | 81, | York, | Brown hematite of II, | 24 |
| Koontz & Myers, | 70, | Cumberland, | Brown hematite of II, | 20 |
| Koser, Jacob, | 46, | Franklin, | Brown hematite of II, | 13 |
| Kyler's Corners, | 348, | Elk, | Clermont limestone, | 92 |
| Lane, N. B., | 327, | Jefferson, | Johnstown cement, | 89 |
| Lane, N. B., | 325, | Jefferson, | Freeport Lower limestone, | 88 |
| Lane, N. B., | 320, | Jefferson, | Freeport Upper limestone, | 88 |
| Landis or Fuller bank, | 93,93a, | York, | Magnetite, | 28 |
| Lanigan & Wynkoop, | 67, | Cumberland, | Brown hematite of II, | 19 |
| Laufman & Co., | 187 | Armstrong, | Freeport Upper coal, | 59 |
| Laughlin, B. F. & A., | 182, | Armstrong, | Freeport Upper coal, | 58 |
| Laughlin, B. F. & A., | 265, | Armstrong, | Coke, | 75 |
| Laughlin, B. F. & A., | 151,152, 153. | Armstrong, | Buhrstone ore, | 49 |
| Laughlin, B. F. & A., | 155,159, | Armstrong, | Buhrstone ore, | 50, 51 |
| Laughlin, B. F. & A., | 156, | Armstrong, | Ore screenings, | 51 |
| Laughlin, B. F. & A., | 303,304, | Armstrong, | Ferriferous limestone, | 85 |
| Laughlin, B. F. & A., | 370,371, | Armstrong, | Pig iron, | 99 |
| Laughlin, B. F. & A., | 407, | Armstrong, | Slag, | 109 |
| Laurel No. 1 bank, | 65, | Cumberland, | Brown hematite of II, | 18 |
| Laurel No. 2 bank, | 64, | Cumberland, | Brown hematite of II, | 18 |
| Lehman (J. C.) No. 2 bank, | 72, | Cumberland, | Brown hematite of II, | 21 |
| Leib bank, | 9, | Franklin, | Bog ore, | 3 |
| Leidig & Hoffer, | 79, | Cumberland, | Brown hematite of II, | 24 |
| Liberty mines, | 375, | Montour, | Fossil ore of V, | 100 |
| Lickel, Lewis, | 110, | Perry, | Fossil ore of VIII, | 34 |
| Lime Kiln bank, | 36, | Franklin, | Brown hematite of II, | 11 |
| Limestone Ridge M.Co., | 103,104, | Perry, | Brown hematite of VIII, | 33 |
| Logan mine, | 92, | York, | Magnetite, | 28 |
| Long, J. C., | 105, | Perry, | Brown hematite of VIII, | 30 |
| Long, D. J., | 95, | Perry, | Brown hematite of VIII, | 33 |
| Long, D. J., | 97, | Perry, | Carbonate ore of VIII, | 31 |
| Long Run, | 313, | Clarion, | Ferriferous limestone, | 87 |
| Longnecker mines, | 88, 89, | York, | Magnetite, | 27 |
| Long Valley Coal Co., | 261, | Bradford, | Coal, | 75 |
| Long Valley Coal Co., | 414, | Bradford, | Coke, | 110 |
| Long, Borleau & Co., | 257, | Lycoming, | Coal, Bed C, | 74 |
| Loy, | 94, | Perry, | Brown hematite of VIII, | 30 |
| Lucy mine, | 30, | Franklin, | Brown hematite of II, | 9 |

| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| MacNamara, Mr., | 98, | Perry, | Brown hematite of VIII, | 31 |
| Magiffin, J. S., | 150, | Jefferson, | Buhrstone ore, | 48 |
| Mahonoy Ridge, | 96, | Perry, | Brown hematite of VIII, | 30 |
| Mahoning Coal Co., | 183, | Armstrong, | Kittanning Lower coal, | 58 |
| Mahoning furnace, | 369, | Armstrong, | Pig iron, | 99 |
| Marshall, Wm., | 296, | Armstrong, | Freeport Upper limestone, | 84 |
| Marshall, T. H., | 175, | Armstrong, | Freeport Upper coal, | 56 |
| McAllister, J. C., | 347, | Elk, | Johnstown Cement, | 92 |
| McAllister, J. C., | 337, | Elk, | Freeport Lower limestone, | 91 |
| McCall's bank, | 211, | Clarion, | Kittanning Lower coal, | 63 |
| McCarthy, Dr. A. R., | 130, | Huntingdon, | Brown hematite of VIII, | 41 |
| McCauley, J., | 364, | Clarion, | Fire-clay, | 96 |
| McCleary, Robt., | 15, | Franklin, | Brown hematite of II, | 5 |
| McClure mine, | 87, | York, | Magnetite, | 26 |
| McClure, J., | 203, | Clarion, | Freeport Lower coal, | 62 |
| McClintockville, | 391, | Venango, | Miscellaneous, | 105 |
| McCormick, Robt, | 124, | Mifflin, | Carbonate ore of VIII, | 39 |
| McCormick & Co., | 32, | Franklin, | Brown hematite of II, | 9 |
| McCormick & Co., | 55, 56; 57, | Cumberland, | Brown hematite of II, | 16; 17 |
| McCormick & Co., | 69, | Cumberland, | Brown hematite of II, | 20 |
| McCormick & Co., | 84, | York, | Brown hematite of II, | 25 |
| McCormick & Co., | 91, 92, | York, | Magnetite, | 28 |
| McConnell tract, | 380, | Franklin, | Brown hematite of II, | 102 |
| McCracken Bros., | 213, | Jefferson, | Freeport Lower coal, | 64 |
| McFarland, R. P., | 11, | Franklin, | Bog ore, | 3 |
| McGowan mine, | 141, | Lycoming, | Fossil ore of VIII, | 45 |
| McHose bank, | 44, | Franklin, | Brown hematite of II, | 13 |
| McIntyre Coal Co., | 244,245, | Lycoming, | Coal, Bed E, | 71 |
| McIntyre Coal Co., | 246, | Lycoming, | Coal, Bed B, | 71 |
| McIntyre Coal Co., | 262, | Lycoming, | Coke, | 75 |
| McNeal bank, | 32, | Franklin, | Brown hematite of II, | 9 |
| McNutt bank, | 202, | Clarion, | Freeport Lower coal, | 62 |
| Means bank, | 50, | Franklin, | Brown hematite of II, | 14 |
| Medlar bank, | 73,73a, | Cumberland, | Brown hematite of II, | 22 |
| Mehaffey & McGill, | 292,293,294, | Armstrong, | Freeport Upper limestone, | 83 |
| Mentzer, David, | 19, | Franklin, | Brown hematite of II, | 6 |
| Merriman & Co., | 243, | Clinton, | Coal, | 71 |
| Merriman & Co., | 263,264, | Clinton, | Coke, | 75 |
| Michael's Ridge, | 119, | Perry, | Fossil ore of V, | 37 |
| Mill bank, | 21, | Franklin, | Brown hematite of II, | 6 |
| Mine No. 3, | 22, | Franklin, | Brown hematite of II, | 7 |
| Mine No. 4, | 23, | Franklin, | Brown hematite of II, | 7 |
| Mine No. 5, | 24, | Franklin, | Brown hematite of II, | 7 |
| Mine No. 8, | 25, | Franklin, | Brown hematite of II, | 8 |
| Mine No. 3, | 280, | Franklin, | Limestone of II, | 80 |
| Mine No. 4, | 281, | Franklin, | Limestone of II, | 80 |
| Mineweaver, Joseph, | 218, | Jefferson, | Brookville coal, | 65 |
| Mobly, Major, | 167, | Butler, | Carbonate ore, | 54 |
| Monroe, S., | 297, | Armstrong, | Freeport Upper limestone, | 84 |
| Mortimer, John, | 184, | Armstrong, | Brookville coal, | 59 |
| Mont Alto I. Co. estate, | 17; 21, | Franklin, | Brown hematite of II, | 5; 6 |

| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| Mont Alto I. Co. estate, | 22,23, 24,25, | Franklin, | Brown hematite of II, | 7 |
| Mont Alto I. Co. estate, | 26,27,28, | Franklin, | Brown hematite of II, | 8 |
| Mont Alto I. Co. estate, | 30,31; 33,34, | Franklin, | Brown hematite of II, | 9; 10 |
| Mont Alto I. Co. estate, | 35,36,37, | Franklin, | Brown hematite of II, | 11 |
| Mont Alto I. Co. estate, | 38,39, 40,41, | Franklin, | Brown hematite of II, | 12 |
| Mont Alto I. Co. estate, | 280,281; 282, | Franklin, | Limestone of II, | 80; 81 |
| Mount Holly Ore Bank Co., | 68,68a, | Cumberland, | Brown hematite of II, | 19 |
| Mount Holly Ore Bank Co., | 73,73a, | Cumberland, | Brown hematite of II, | 22 |
| Mount Holly ore bank, | 73,73a, | Cumberland, | Brown hematite of II, | 22 |
| Mt. Hope Coal Co., | 242, | Cameron, | Clarion coal, | 70 |
| Mt. Hope Colliery, | 241, | Cameron, | Dagus coal, | 70 |
| Mullen bank, | 74, | Cumberland, | Brown hematite of II, | 22 |
| Mumper bank, | 91, | York, | Magnetite, | 28 |
| Murphy, T., | 207, | Clarion, | Freeport Lower coal, | 63 |
| Mush (B. G.) & Co., | 117,118, | Perry, | Fossil ore of V, | 37 |
| Neikirk bank, | 44, | Franklin, | Brown hematite of II, | 13 |
| New Athens, | 310, | Clarion, | Freeport Upper limestone, | 86 |
| Newport, | 286,287,288, | Perry, | Limestone of VIII, | 82 |
| North Western Mining and Exchange Co., | 227,228,229, | Elk, | Coal, | 67 |
| Oil Creek, | 401, | Venango, | Miscellaneous, | 107 |
| Old mine, | 76, | Cumberland, | Brown hematite of II, | 22 |
| Old mines, | 250, | Lycoming, | Coal, | 72 |
| Old Mt. Pleasant, | 3, | Franklin, | Brown hematite of II, | 1 |
| Old Peach Orchard bank, | 60, | Cumberland, | Brown hematite of II, | 17 |
| Old Red Run mines, | 248, | Lycoming, | Coal, Bed B, | 72 |
| Old Southampton bank, | 47, | Franklin, | Brown hematite of II, | 14 |
| Oregon township, | 357,358, | Wayne, | Catskill limestone, | 94 |
| Oyster's quarry, | 342,343,344, | Elk, | Ferriferous limestone, | 92 |
| Panama, | 403, | New York, | Miscellaneous, | 107 |
| Pass Orchard bank, | 17, | Franklin, | Brown hematite of II, | 5 |
| Patterson mine, | 379, | Blair, | Brown hematite of II, | 102 |
| Patterson, J. F., | 172, | Armstrong, | Gallitzin coal, | 56 |
| Peach Orchard (old) bank, | 60, | Cumberland, | Brown hematite of II, | 17 |
| Peffer bank, | 61, | Cumberland, | Brown hematite of II, | 17 |
| Pepper bank, | 76, | Cumberland, | Brown hematite of II, | 22 |
| Peterman, George, | 113,114, 115,116, | Perry, | Fossil ore of VIII, | 35 |
| Phila. and Reading Coal and Iron Co.'s banks, | 59; 77, 77a,78,78a, | Cumberland, | Brown hematite of II, | 17; 23 |
| Pine Creek furnace, | 372, | Armstrong, | Pig iron, | 99 |
| Pine Grove bank, | 63, | Cumberland, | Brown hematite of II, | 18 |
| Pine Grove quarry, | 278, | Cumberland, | Limestone of II, | 80 |

| Owner's Name. | No. of Anal. | Counties. | Mineral | Page. |
|---|---|---|---|---|
| Plaster (Ruby) bank, | 48, | Franklin, | Brown hematite of II, | 14 |
| Pond No. 1 bank, | 34, | Franklin, | Brown hematite of II, | 10 |
| Pond No. 2 bank, | 33, | Franklin, | Brown hematite of II, | 10 |
| President, | 392, | Venango, | Miscellaneous, | 105 |
| Promise mine, | 39, | Franklin, | Brown hematite of II, | 12 |
| Putney, Geo. S., | 302, | Armstrong, | Johnstown cement, | 85 |
| Quiggleville mine, | 142, | Lycoming, | Fossil ore of VIII, | 45 |
| Railroad bank, | 7, | Franklin, | Brown hematite of II, | 2 |
| Red Bank furnace, | 270, | Clarion, | Coke, | 77 |
| Red Run Coal Co., | 247,248,249, | Lycoming, | Coal, | 72 |
| Reed, D., | 186, | Armstrong, | Freeport Lower coal, | 59 |
| Reefer, Jno., | 295, | Armstrong, | Freeport Upper limestone, | 84 |
| Reichert quarry, | 311, | Clarion, | Freeport Upper limestone, | 86 |
| Reimersburg, | 312, | Clarion, | Freeport Lower limestone, | 86 |
| Reynolds, Ross, | 185, | Armstrong, | Kittanning Lower coal, | 59 |
| Reynolds, Ross, | 368, | Armstrong, | Fire-clay, | 97 |
| Reynolds, Ross, | 306, | Armstrong, | Ferriferous limestone, | 85 |
| Rhea, J. C., | 308, | Armstrong, | Ferriferous limestone, | 86 |
| Rhea, J. C., | 174, | Armstrong, | Kittanning Lower coal, | 56 |
| Richmond bog bank, | 2, | Franklin, | Bog ore, | 1 |
| Rinesmith, | 108, | Perry, | Brown hematite of VII, | 33 |
| Rock, George, | 16, | Franklin, | Brown hematite of II, | 5 |
| Rock, Jacob, | 29, | Franklin, | Brown hematite of II, | 9 |
| Rogers, R., | 189, | Armstrong, | Kittanning Lower coal, | 60 |
| Romig mine, | 224, | Elk, | Coal, Alton Upper, | 66 |
| Rossland Mining Co., | 374, | Monroe, | Brown hematite, | 100 |
| Ruby (Plaster) bank, | 48, | Franklin, | Brown hematite of II, | 14 |
| Ruth mine, | 31, | Franklin, | Brown hematite of II, | 9 |
| Rutherford opening, | 56, | Cumberland, | Brown hematite of II, | 16 |
| Safe Harbor furnace, | 373, | Lycoming, | Pig iron, | 99 |
| Salona ore bank, | 136,137, | Clinton, | Brown hematite, | 44 |
| Schrecengost, B. U., | 171, | Armstrong, | Freeport Lower coal, | 56 |
| Schuyler, Mr., | 106, | Perry, | Brown hematite of VIII, | 33 |
| Seidel, J. B., | 109, | Perry, | Fossil ore of VIII, | 34 |
| Seyfert & McManus, | 66, | Cumberland, | Brown hematite of II, | 19 |
| Shade, Dr. J. A., | 125, | Huntingdon, | Brown hematite of VIII, | 40 |
| Shelly & Hofter, | 85, | York, | Magnetite, | 26 |
| Shields, Samuel, | 332, | Jefferson, | Ferriferous limestone, | 90 |
| Shiery quarry, | 282, | Franklin, | Limestone of II, | 81 |
| Shook, David, | 404, | Franklin, | Marl, | 108 |
| Sill, James, | 133,134, | Bedford, | Fossil ore of V, | 43 |
| Silver Creek mine, | 233, | Elk, | Clermont coal, | 69 |
| Sligo furnace, | 161, | Clarion, | Buhrstone ore, | 52 |
| Sligo furnace, | 315, | Clarion, | Ferriferous limestone, | 87 |
| Sligo Fire Brick Works, | 365, | Clarion, | Fire-clay, | 96 |
| Sligo Branch Coal Co., | 208, | Clarion, | Kittanning Lower coal, | 63 |
| Sligo Branch Coal Co., | 271, | Clarion, | Coke, | 77 |
| Sloan, | 205, | Clarion, | Kittanning Lower coal, | 63 |
| Small, John, | 27, | Franklin, | Brown hematite of II, | 8 |
| Smith, Jacob, | 319, | Jefferson, | Limestone, | 87 |
| Smith, James, | 317,318, | Jefferson, | Limestone, | 87 |

| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| Smith, Henry, | 107, | Perry, | Brown hematite of VIII, | 33 |
| Smith, Duncan & Avery, | 12; 20, | Franklin, | Brown hematite of II, | 4; 6 |
| Smullen bank, | 202, | Clarion, | Freeport Lower coal, | 62 |
| Snodgrass, Robert, | 169, | Crawford, | Carbonate ore, | 55 |
| Snodgrass quarry, | 395, | Mercer, | Miscellaneous, | 106 |
| Somerville, T. O., | 209, | Clarion, | Kittanning Middle coal, | 63 |
| Songer, | 204, | Clarion, | Kittanning Lower coal, | 63 |
| South Mountain Mining and Iron Co., | 62,63,64,65, | Cumberland, | Brown hematite of II, | 18 |
| Southampton old bank, | 47, | Franklin, | Brown hematite of II, | 14 |
| State Line and Sullivan R.R. Co., | 258,259,260, | Sullivan, | Coal, | 74 |
| Stewart, D., | 367, | Armstrong, | Fire-clay, | 97 |
| Stewardson furnace, | 182, | Armstrong, | Freeport Upper coal, | 58 |
| Stewardson furnace, | 265, | Armstrong, | Coke, | 75 |
| Stewardson furnace, | 303,304, | Armstrong, | Ferriferous limestone, | 85 |
| Stewardson furnace, | 151,152, 153; 159, | Armstrong, | Buhrstone ore, | 49; 51 |
| Stewardson furnace, | 155, | Armstrong, | Roasted ore, | 50 |
| Stewardson furnace, | 156, | Armstrong, | Ore screenings, | 51 |
| Stewardson furnace, | 370,371, | Armstrong, | Pig iron, | 99 |
| Stewardson furnace, | 407, | Armstrong, | Slag, | 109 |
| Still, Thomas, | 289,290, | Perry, | Limestone of VI, | 82 |
| Stinger, Squire, | 13, | Franklin, | Brown hematite of II, | 4 |
| St. Mary's Coal Co., | 234,235,236, | Elk, | Dagus coal, | 69 |
| Stouffer, Jacob, | 10, | Franklin, | Bog ore, | 3 |
| Strickler bank, | 75, | Cumberland, | Brown hematite of II, | 22 |
| Swayne, Benjamin, | 272, | Chester, | Limestone of II, | 79 |
| Tarentum, | 397,398, | Allegheny, | Miscellaneous, | 106 |
| Taylor, Isaac, | 126, | Huntingdon, | Brown hematite of VIII, | 40 |
| Titusville, | 405, | Crawford, | Miscellaneous, | 108 |
| Thompson, Mrs., | 176,177,178, | Armstrong, | Kittanning Upper coal, | 57 |
| Trout, Wm., | 131, | Fulton, | Brown hematite, | 42 |
| Turley, J. E., | 225, | Elk, | Coal, | 67 |
| Underwood mine, | 90, | York, | Magnetite, | 27 |
| Venormer, Joshua, | 122, | Juniata, | Fossil ore of V, | 38 |
| Walker, Wm., | 168, | Mercer, | Carbonate ore, | 55 |
| Wangler, J. A., | 191, | Armstrong, | Clarion coal, | 60 |
| Warren, | 402, | Warren, | Miscellaneous, | 107 |
| Washer ore pit, | 100,101,102, | Perry, | Brown hematite of VIII, | 32 |
| Webster bank, | 12, | Franklin, | Brown hematite of II, | 4 |
| Weinman, Geo., | 8, | Franklin, | Brown hematite of II, | 3 |
| Welty's quarry, | 273,274, 275,276,277, | York, | Mesozoic limestone, | 79 |
| White Rock mine, | 40, | Franklin, | Brown hematite of II, | 12 |
| White & Rex, | 128,129, | Huntingdon, | Fossil ore of V, | 41 |
| Wiestling bank, | 41, | Franklin, | Brown hematite of II, | 12 |
| Wild Cat opening, | 62, | Cumberland, | Brown hematite of II, | 18 |
| Wilkins mine, | 203, | Clarion, | Freeport Lower coal, | 62 |
| Williams, J., | 220, | Jefferson, | Coal, | 65 |
| Wilsham, Joseph, | 351, | Clinton, | Limestone of II, | 93 |

| Owner's Name. | No. of Anal. | Counties. | Mineral. | Page. |
|---|---|---|---|---|
| Wilson, H. R., | 223, | Elk, | Coal, | 66 |
| Wilson place, | 352, | Lycoming, | Limestone of VI, | 94 |
| Winfield furnace, | 190, | Armstrong, | Clarion coal, | 60 |
| Winslow, G. W., | 339, | Elk, | Ferriferous limestone, | 91 |
| Wolf bank, | 80, | York, | Brown hematite of II, | 24 |
| Young, J., | 138,139,140, | Lycoming, | Fossil ore of V, | 44 |

## B.—Alphabetical Index of Counties.


| County. | No. of anal. | Mineral. | Owner. | Page. |
|---|---|---|---|---|
| Adams, | 377, | Magnetic sand, | Fairfield, | 101 |
| Allegheny, | 381 to 387, | Miscellaneous, | Boyd's Hill Gas Well, | 103,104 |
| Do. | 397,398, | do. | Tarentum, | 106 |
| Armstrong, | 170, | Pittsburgh coal, | H. M. Ewing, | 56 |
| Do. | 172, | Gallitzin coal, | J. F. Patterson, | 56 |
| Do. | 173, | Freeport Upper coal, | Beer's estate, | 56 |
| Do. | 180, | do. do. | J. A. Colwell, | 58 |
| Do. | 188, | do. do. | John Hagy, | 60 |
| Do. | 187, | do. do. | Laufman & Co., | 59 |
| Do. | 182, | do. do. | Stewardson furnace, | 58 |
| Do. | 175, | do. do. | T. H. Marshall, | 56 |
| Do. | 181, | Freeport Lower coal, | J. A. Colwell, | 58 |
| Do. | 186, | do. do. | D. Reed, | 59 |
| Do. | 171, | do. do. | B. U. Schrecengost, | 56 |
| Do. | 179, | Kittanning Upper coal, | Brooks' mine, | 58 |
| Do. | 176,177,178, | do. do. | Mrs. Thompson, | 57 |
| Do. | 183, | Kittanning Lower coal, | Mahoning Coal Co., | 58 |
| Do. | 185, | do. do. | Ross Reynolds, | 59 |
| Do. | 174, | do. do. | J. C. Rhea, | 56 |
| Do. | 189, | do. do. | R. Rogers, | 60 |
| Do. | 191, | Clarion coal, | J. A. Wangler, | 60 |
| Do. | 190, | do. | Winfield furnace, | 60 |
| Do. | 184, | Brookville coal, | John Mortimer, | 59 |
| Do. | 265, | Coke, | Stewardson furnace, | 75 |
| Do. | 154, | Buhrstone ore, | Campbell & Barrett, | 49 |
| Do. | 157, | do. | J. A. Colwell, | 51 |
| Do. | 158, | do. | Brady's Bend Iron Co., | 51 |
| Do. | 160, | do. | Brown, Neale & Orr, | 52 |
| Do. | 151,152,153, | do. | Stewardson furnace, | 49 |
| Do. | 155, | do. (roasted,) | do. do. | 50 |
| Do. | 159, | do. | do. do. | 51 |
| Do. | 156, | do. (screenings,) | do. do. | 51 |
| Do. | 291, | Freeport Upper limestone, | W. R. Hamilton, | 83 |
| Do. | 292,293,294, | do. do. | Mehaffey & McGill, | 83 |
| Do. | 295, | do. do. | John Reefer, | 84 |
| Do. | 296, | do. do. | William Marshall, | 84 |
| Do. | 297, | do. do. | S. Monroe, | 84 |
| Do. | 298,299,300, | do. do. | A. J. Dull & Co., | 84 |
| Do. | 301, | Johnstown cement, | M. Davis, | 85 |
| Do. | 302, | do. | George S. Putney, | 85 |
| Do. | 303,304, | Ferriferous limestone, | Stewardson furnace, | 85 |
| Do. | 305, | do. | J. A. Colwell, | 85 |
| Do. | 306, | do. | Ross Reynolds, | 85 |
| Do. | 307, | do. | P. George, | 86 |
| Do. | 308, | do. | J. C. Rhea, | 86 |
| Do. | 309, | do. | P. Graff, | 86 |
| Do. | 366, | Fire-clay, | Brown, Neale & Orr, | 97 |

| County. | No. of anal. | Mineral. | Owner. | Page. |
|---|---|---|---|---|
| Armstrong, | 367, | Fire-clay, | D. Stewart, | 97 |
| Do. | 368, | do. | Ross Reynolds, | 97 |
| Do. | 369, | Pig iron, | Mahoning furnace, | 99 |
| Do. | 372, | do. | Pine Creek furnace, | 99 |
| Do. | 370,371, | do. | Stewardson furnace, | 99 |
| Do. | 407, | Slag, | Stewardson furnace, | 109 |
| Beaver, | 388,389,390, | Miscellaneous, | Economy well No. 2, | 104 |
| Bedford, | 133,134, | Fossil ore of V, | James Sill, | 43 |
| Blair, | 379, | Brown hematite of II, | Patterson mine, | 102 |
| Bradford, | 408 to 413, | Coals, | Barclay coal basin, | 109,110 |
| Do. | 261, | Coal, | Long Valley Coal Co., | 75 |
| Do. | 414, | Coke, | do. do. | 110 |
| Butler, | 166, | Carbonate ore, | Hindman farm, | 54 |
| Do. | 167, | do. | Major Mobly, | 54 |
| Cameron, | 241, | Dagus coal, | Mt. Hope colliery, | 70 |
| Do. | 242, | Clarion coal, | do. do. | 70 |
| Centre, | 135, | Brown hematite of II, | Wm. B. Addleman, | 43 |
| Chester, | 272, | Limestone of II, | Benj. Swayne, | 79 |
| Clarion, | 200, | Freeport Upper coal, | Goheen's bank, | 62 |
| Do. | 192, | Freeport Lower coal, | Fairmount Coal Co., | 60 |
| Do. | 197,198, | do. do. | do. do. | 61 |
| Do. | 201, | do. do. | Goheen's bank, | 62 |
| Do. | 202, | do. do. | McNutt, (Smullen,) | 62 |
| Do. | 203, | do. do. | J. McClure, (Wilkins,) | 62 |
| Do. | 207, | do. do. | T. Murphy, | 63 |
| Do. | 196, | Kittanning Middle coal, | Fairmount Coal Co, | 61 |
| Do. | 209, | do. do. | T. O. Somerville, | 63 |
| Do. | 193,194,195; 199, | Kittanning Lower coal, | Fairmount Coal Co., | 60; 61 |
| Do. | 204, | do. do. | Songer, | 63 |
| Do. | 205, | do. do. | Sloan, | 63 |
| Do. | 206, | do. do. | Clarion Coal Co., | 63 |
| Do. | 208, | do. do. | Sligo Branch Coal Co., | 63 |
| Do. | 210, | do. do. | Fox bank, | 63 |
| Do. | 211, | do. do. | McCall's bank, | 63 |
| Do. | 266,267,268,269, | Cokes, | Fairmount Coal Co., | 76 |
| Do. | 270, | Coke, | Red Bank furnace, | 77 |
| Do. | 271, | do. | Sligo Branch Coal Co., | 77 |
| Do. | 164, | Carbonate ore, | Fairmount Coal Co., | 53 |
| Do. | 161, | Buhrstone ore, | Sligo furnace, | 52 |
| Do. | 162, | do. | Fox farm, | 52 |
| Do. | 163, | do. | Hindman quarry, | 52 |
| Do. | 310, | Freeport Upper limestone, | New Athens, | 86 |
| Do. | 311, | do. do. | Reichert's quarry, | 86 |
| Do. | 312, | Freeport Lower limestone, | Reimersburg, | 86 |
| Do. | 313, | Ferriferous limestone, | Long Run, | 87 |
| Do. | 314, | do. do. | Hindman quarry, | 87 |
| Do. | 315, | do. do. | Sligo furnace, | 87 |
| Do. | 316, | do. do. | Barger quarry, | 87 |
| Do. | 364, | Fire-clay, | J. McCauley, | 96 |
| Do. | 365, | do. | Sligo Fire-Brick Works, | 96 |
| Clinton, | 243, | Coal, | H. Merriman & Co., | 71 |

| County. | No. of anal. | Mineral. | Owner. | Page. |
|---|---|---|---|---|
| Clinton, | 263,264, | Coke, | H. Merriman & Co., | 75 |
| Do. | 136,137, | Brown hematite of II,(?) | Salona ore bank, | 44 |
| Do. | 351, | Limestone of II, | Joseph Wilsham, | 93 |
| Crawford, | 169, | Carbonate ore, | Robert Snodgrass, | 55 |
| Do. | 405, | Clay, | Gravel pit well, | 108 |
| Cumberland, | 51, | Brown hematite of II, | John H. Cressler, | 15 |
| Do. | 52, | do. do. | Geo. Clever, | 15 |
| Do. | 53, | do. do. | Clever No. 1 bank, | 15 |
| Do. | 53a, | do. do. | "Clever No. 1 bank," | 15 |
| Do. | 54, | do. do. | John Bridges, | 16 |
| Do. | 55, 56, | do. do. | Calico bank, | 16 |
| Do. | 57, | do. do. | Chestnut bank, | 17 |
| Do. | 58, | do. do. | Geo. H. Clever, | 17 |
| Do. | 59, | do. do. | Big Pond bank, | 17 |
| Do. | 60, | do. do. | Old Peach Orchard, | 17 |
| Do. | 61, | do. do. | Peffer bank, | 17 |
| Do. | 62, | do. do. | Wild Cat opening, | 18 |
| Do. | 63, | do. do. | Pine Grove, | 18 |
| Do. | 64, | do. do. | Laurel No. 2, | 18 |
| Do. | 65, | do. do. | do. No. 1, | 18 |
| Do. | 66, | do. do. | Henry Clay No. 3, | 19 |
| Do. | 67, | do. do. | do. No. 2, | 19 |
| Do. | 68,68a, | do. do. | do. No. 1, | 19 |
| Do. | 69, | do. do. | Diven tract, | 20 |
| Do. | 70, | do. do. | Koontz & Myers, | 20 |
| Do. | 71,71a, | do. do. | Grove bank, | 21 |
| Do. | 72, | do. do. | J. C. Lehman No. 2, | 21 |
| Do. | 73,73a, | do. do. | Mt. Holly, (Medlar,) | 22 |
| Do. | 74, | do. do. | Mullen, | 22 |
| Do. | 75, | do. do. | Strickler, | 22 |
| Do. | 76, | do. do. | Pepper, | 22 |
| Do. | 77,77a, | do. do. | Ege, | 23 |
| Do. | 78,78a, | do. do. | Beltzhoover, | 23 |
| Do. | 79, | do. do. | Leidig & Hoffer, | 24 |
| Do. | 278, | Limestone of II, | Pine Grove quarry, | 80 |
| Do. | 279, | do. do. | Craighead, | 80 |
| Elk, | 230, | Coal, | Enos Hays, | 68 |
| Do. | 227,228,229, | Coal, | North-Western Mining and Exchange Co., | 67 |
| Do. | 237, | Dagus coal, | Cascade mine, | 70 |
| Do. | 234,235,236, | do. | St. Mary's Coal Co., | 69 |
| Do. | 222, | Clarion coal, | Geo. Brown, | 66 |
| Do. | 221, | do. | Ben. Johnson, | 66 |
| Do. | 233, | do. | Silver Creek mine, | 69 |
| Do. | 231,232, | Alton coal, | Eureka mines, | 68 |
| Do. | 224, | do. | Romig mine, | 66 |
| Do. | 226, | do. | V. Dennison, | 67 |
| Do. | 239, | do. | Glen Mayo colliery, | 70 |
| Do. | 223, | do. | H. R. Wilson, | 66 |
| Do. | 225, | do. | J. E. Turley, | 67 |
| Do. | 238, | Marshburg coal, | E. K. Gresh, | 70 |

| County. | No. of anal. | Mineral. | Owner. | Page. |
|---|---|---|---|---|
| Elk, | 240, | Hoyt coal, | Genl. Kane, | 70 |
| Do. | 335, | Freeport Upper limestone, | J. S. Hyde, | 91 |
| Do. | 336, | Freeport Lower limestone, | J. S. Chamberlain, | 91 |
| Do. | 337, | do. do. | J. C. McAllister, | 91 |
| Do. | 338, | do. do. | T. Fox, | 91 |
| Do. | 347, | Johnstown cement, | J. C. McAllister, | 92 |
| Do. | 339, | Ferriferous limestone, | G. W. Winslow, | 91 |
| Do. | 340, | do. do. | J. S. Chamberlain, | 91 |
| Do. | 341, | do. do. | Brandy Camp, | 91 |
| Do. | 342,343,344, | do. do. | Oyster's quarry, | 92 |
| Do. | 345,346, | do. do. | Genl. Kane, | 92 |
| Do. | 348, | Clermont limestone, | Kyler's Corners, | 92 |
| Do. | 349,350, | Benezette limestone, | Caledonia Road, | 93 |
| Do. | 359, | Fire-clay, | Barr & Radcliffe, | 95 |
| Do. | 360, | do. | V. Dennison, | 95 |
| Do. | 361,362, | do. | Glen Mayo colliery, | 95 |
| Forest, | 165, | Brown hematite C. M., | A. B. Kelly, | 53 |
| Do. | 334, | Tionesta limestone, | Kelley's quarry, | 90 |
| Franklin, | 1, | Brown hematite of VIII, | Bower's furnace, | 1 |
| Do. | 2, | Bog ore of III, | Richmond bank, | 1 |
| Do. | 9, | do. do. | Leib, (J. S. Whitmer & Co.), | 3 |
| Do. | 10, | do. do. | Jacob Stouffer, | 3 |
| Do. | 11, | do. do. | R. P. McFarland, | 3 |
| Do. | 3, | Brown hematite of II, | Old Mt. Pleasant, | 1 |
| Do. | 4, | do. do. | Beaver bank, | 1 |
| Do. | 5, | do. do. | Jennings Jones, | 2 |
| Do. | 6,6a, | do. do. | Carrick furnace, | 2 |
| Do. | 7, | do. do. | Railroad bank, | 2 |
| Do. | 8, | do. do. | Geo. Weinman, | 3 |
| Do. | 12, | do. do. | Webster bank, | 4 |
| Do. | 13, | do. do. | Squire Stinger, | 4 |
| Do. | 14, | do. do. | Garlic bank, | 4 |
| Do. | 15, | do. do. | Robt. McCleary, | 5 |
| Do. | 16, | do. do. | Geo. Rock, | 5 |
| Do. | 17, | do. do. | Pass Orchard, | 5 |
| Do. | 18, | do. do. | Wyeth Douglas, | 5 |
| Do. | 19, | do. do. | David Mentzer, | 6 |
| Do. | 20, | do. do. | Smith, Duncan & Avery | 6 |
| Do. | 21, | do. do. | Mill bank, Mt. Alto I. Co | 6 |
| Do. | 22, | do. do. | Mine No. 3, do. | 7 |
| Do. | 23, | do. do. | Mine No. 4, do. | 7 |
| Do. | 24, | do. do. | Mine No. 5, do. | 7 |
| Do. | 25, | do. do. | Mine No. 8, do. | 8 |
| Do. | 26, | do. do. | Benj. George, do. | 8 |
| Do. | 27, | do. do. | John Small, do. | 8 |
| Do. | 28, | do. do. | Thos. Calliman, do. | 8 |
| Do. | 29, | do. do. | Jacob Rock, | 9 |
| Do. | 30, | do. do. | Lucy mine, Mt. Alto Iron Co., | 9 |

| County. | No. of anal. | Mineral. | Owner. | Page. |
|---|---|---|---|---|
| Franklin, | 31, | Brown hematite of II, | Ruth mine, Mt. Alto Iron Co., | 9 |
| Do. | 32, | do. do. | McNeal bank, | 9 |
| Do. | 33, | do. do. | Pond No. 2, Mt. Alto Iron Co., | 10 |
| Do. | 34, | do. do. | Pond No. 1, Mt. Alto Iron Co., | 10 |
| Do. | 35, | do. do. | English mine, Mt. Alto Iron Co., | 11 |
| Do. | 36, | do. do. | Lime Kiln bank, Mt. Alto Iron Co., | 11 |
| Do. | 37, | do. do. | Guilford bank, Mont Alto Iron Co., | 11 |
| Do. | 38, | do. do. | Hope mine, Mt. Alto Iron Co., | 12 |
| Do. | 39, | do. do. | Promise mine, Mont Alto Iron Co., | 12 |
| Do. | 40, | do. do. | White Rock mine, Mt. Alto Iron Co., | 12 |
| Do. | 41, | do. do. | Wiestling bank, Mont Alto Iron Co., | 12 |
| Do. | 42, | do. do. | Wm. L. Chambers, | 13 |
| Do. | 43, | do. do. | Ahl's pipe ore bank, | 13 |
| Do. | 44, | do. do. | McHose (Neikirk), | 13 |
| Do. | 45, | do. do. | Joseph Cressler, | 13 |
| Do. | 46, | do. do. | Jacob Koser, | 13 |
| Do. | 47, | do. do. | Old Southampton bank | 14 |
| Do. | 48, | do. do. | Ruby (Plaster) bank, | 14 |
| Do. | 49, | do. do. | Gochenauer & Rohrer, | 14 |
| Do. | 50, | do. do. | Means bank, | 14 |
| Do. | 380, | do. do. | McConnell tract, | 102 |
| Do. | 280,281; 282, | Limestone of II, | Mt. Alto Iron Co., | 80; 81 |
| Do. | 285, | do. do. | M. E. Battin, | 82 |
| Do. | 283,284, | do. do. | S. Z. Hawbecker, | 81 |
| Do. | 404, | Marl, | David Shook, | 108 |
| Fulton, | 132, | Brown hematite of VIII, | P. Awl & Bro., | 42 |
| Do. | 131, | Brown hematite, | Wm. Trout. | 42 |
| Huntingdon, | 125, | Brown hematite of VIII, | Dr. J. A. Shade, | 40 |
| Do. | 126, | do. do. | Isaac Taylor, | 40 |
| Do. | 127, | Brown hematite of II, | Wm. B. Addleman, | 40 |
| Do. | 130, | Fossil ore of VIII (?), | Dr. A. R. McCarthy, | 41 |
| Do. | 128,129, | Fossil ore of V, | Dull & Bradley, | 41 |
| Jefferson, | 212, | Freeport Lower coal, | J. Keslar, | 64 |
| Do. | 213, | do. do. | McCracken Bros., | 64 |
| Do. | 214,215, | do. do. | George Blose, | 64 |
| Do. | 216, | do. do. | A. Huffman, | 65 |
| Do. | 217, | do. do. | A. Eshbaugh, | 65 |
| Do. | 218, | Brookville coal, | Jos. Mineweaver, | 65 |
| Do. | 219, | Coal, | W. B. Cowan, | 65 |
| Do. | 220, | do. | J. Williams, | 65 |
| Do. | 150, | Buhrstone ore, | J. S. Magiffin, | 48 |

| County. | No. of anal. | Mineral. | Owner. | Page. |
|---|---|---|---|---|
| Jefferson, | 149, | Brown hematite C. M., | Owen Butterfield, | 47 |
| Do. | 148, | do. do. | Perry Kahlé, | 47 |
| Do. | 333, | Limestone, | Frost, | 90 |
| Do. | 317,318, | Limestone B. M., | James Smith, | 87 |
| Do. | 319, | do. do. | Jacob Smith, | 87 |
| Do. | 321,322, | Freeport Upper limestone, | John Iler, | 88 |
| Do. | 320, | do. do. | N. B. Lane, | 88 |
| Do. | 326, | Freeport Lower limestone, | Evans Round Top, | 88 |
| Do. | 325, | do. do. | N. B. Lane, | 88 |
| Do. | 323, | Freeport limestone, | D. Hopkins, | 88 |
| Do. | 324, | do. do. | A. Huffman, | 88 |
| Do. | 327, | Johnstown cement, | N. B. Lane, | 89 |
| Do. | 328, | do. do. | John Iler, | 89 |
| Do. | 329, | Ferriferous limestone, | C. Bovaird, | 89 |
| Do. | 330, | do. do. | Wm. Hanna, | 89 |
| Do. | 331, | do. do. | A. Enty, | 89 |
| Do. | 332, | do. do. | Samuel Shields, | 90 |
| Do. | 363, | Fire-clay, | Brown, Erskine & Co., | 96 |
| Juniata, | 121, | Brown hematite of VIII, | Mr. Clark, | 38 |
| Do. | 122, | Fossil ore of V, | Joshua Venormer, | 38 |
| Lebanon, | 376, | Magnetite, | Cornwall ore bank, | 101 |
| Lycoming, | 244,245,246, | Coal, | McIntyre Coal Co., | 71 |
| Do. | 247,248,249, | do. | Red Run Coal Co., | 72 |
| Do. | 250, | do. | Old mines, | 72 |
| Do. | 251,252, 253,254, | do. | English mines, | 73 |
| Do. | 255, | do. | Bannan mine, | 74 |
| Do. | 256, | do. | J. W. Baché, | 74 |
| Do. | 257, | do. | Long, Borleau & Co., | 74 |
| Do. | 262, | Coke, | McIntyre Coal Co., | 75 |
| Do. | 145, | Carbonate ore, | Cartersville furnace, | 46 |
| Do. | 141, | Fossil ore of VIII, | McGowan mine, | 45 |
| Do. | 142, | do. do. | Quiggleville mine, | 45 |
| Do. | 143, | do. do. | Hayes mine, | 45 |
| Do. | 144, | do. do. | Furnace Run mines, | 45 |
| Do. | 138,139,140, | Fossil ore of V, | J. Young, | 44 |
| Do. | 352, | Limestone of VI, | Wilson place, | 94 |
| Do. | 353, | do. do. | Fergusson's quarry, | 94 |
| Do. | 354, | do. do. | Bailey's quarry, | 94 |
| Do. | 373, | Iron, | Safe Harbor furnace, | 99 |
| Mercer, | 168, | Carbonate ore, | Wm. Walker, | 55 |
| Do. | 395, | Miscellaneous, | Snodgrass quarry, | 106 |
| Do. | 396, | do. | Gibson Run, | 106 |
| Mifflin, | 124, | Carbonate ore, | Robt. McCormick, | 39 |
| Do. | 123, | Fossil ore of V, | J. J. Dull, | 39 |
| Monroe, | 374, | Brown hematite, | Rossland Mining Co., | 100 |
| Montour, | 375, | Fossil ore of V, | Liberty mines, | 100 |
| Perry, | 120, | Red hematite of IX, | Christian Basom, | 37 |
| Do. | 97, | Carbonate ore, | D. J. Long, | 31 |
| Do. | 94, | Brown hematite of VIII, | Loy, | 30 |
| Do. | 95, | do. do. | D. J. Long, | 30 |
| Do. | 96, | do. do. | Mahonoy Ridge, | 30 |

| County. | No. of anal. | Mineral. | Owner. | Page. |
|---|---|---|---|---|
| Perry, | 98, | Brown hematite of VIII, | MacNamara, | 31 |
| Do. | 99, | do. do. | Barnitz, | 31 |
| Do. | 100,101,102, | do. do. | Washer Ore Pit, | 32 |
| Do. | 103,104, | do. do. | Limestone Ridge Mining Co., | 33 |
| Do. | 105, | do. do. | J. C. Long, | 33 |
| Do. | 106, | do. do. | Mr. Schuyler, | 33 |
| Do. | 107, | do. do. | Henry Smith, | 33 |
| Do. | 108, | Brown hematite of VII, | Rinesmith, | 33 |
| Do. | 109, | Fossil ore of VIII, | J. B. Seidel, | 34 |
| Do. | 110, | do. do. | Lewis Lickel, | 34 |
| Do. | 111, | do. do. | Philip Cook, | 34 |
| Do. | 112, | do. do. | Cumbler, | 35 |
| Do. | 113,114,115,116, | do. do. | Geo. Peterman, | 35 |
| Do. | 117,118, | Fossil ore of V, | B. G. Mush & Co., | 37 |
| Do. | 119, | do. do. | Michael's Ridge, | 37 |
| Do. | 286,287,288, | Limestone of VIII, | Newport, | 82 |
| Do. | 289,290, | Limestone of VI, | Thos. Still, | 82 |
| Sullivan, | 258,259,260, | Coal, | State Line and Sullivan R.R. Co., | 74 |
| Do. | 146,147, | Carbonate ore, | Ganoga Lake, | 47 |
| Venango, | 391, | Miscellaneous, | McClintockville, | 105 |
| Do. | 392, | do. | President, | 105 |
| Do. | 393, | do. | Franklin, | 105 |
| Do. | 394, | do. | Fosters, | 105 |
| Do. | 401, | do. | Oil creek, | 107 |
| Warren, | 399,400, | do. | Clapp farm, | 107 |
| Do. | 402, | do. | Asylum quarry, | 107 |
| Wayne, | 406, | Catskill red shale, | Texas township, | 108 |
| Do. | 355,356, | Catskill limestone, | Cherry Ridge township | 94 |
| Do. | 357,358, | do. | Oregon township, | 94 |
| York, | 80, | Brown hematite of II, | Wolf, | 24 |
| Do. | 81, | do. do. | Heck (Knaub) bank, | 24 |
| Do. | 82, | do. do. | Coover & Wolf, | 24 |
| Do. | 83, | do. do. | C. H. Bender, | 25 |
| Do. | 84, | do. do. | McCormick & Co., (Atticks,) | 25 |
| Do. | 85, | Magnetite, | Shelly & Hoffer, | 26 |
| Do. | 86, | do. | Bell mine, | 26 |
| Do. | 87, | do. | McClure mine, | 26 |
| Do. | 88, | do. | Longnecker old mine, | 27 |
| Do. | 89, | do. | Longnecker new mine, | 27 |
| Do. | 90, | do. | Underwood, | 27 |
| Do. | 91, | do. | Mumper, (McCormick & Co.,) | 28 |
| Do. | 92, | do. | Logan, (McCormick & Co.,) | 28 |
| Do. | 93,93a, | do. | Landis or Fuller mine, | 28 |
| Do. | 378, | Micaceous hematite, | Judge Dare, | 102 |
| Do. | 273,274,275, 276,277, | Mesozoic limestone, | Welty's quarries, | 79 |
| New York State, | 403, | Miscellaneous, | Panama, | 107 |

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